THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

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GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
Proprietors: STEVENS & CO.,
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Works: BRIXHAM, TORBAY.

THOMAS PROUD,
BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
Head London Office:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE.
See Page 786.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

CHANGE OF ADDRESS.
GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:

RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

AND

COOMBS WOOD TUBE-WORKS, HALESOWEN,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS,

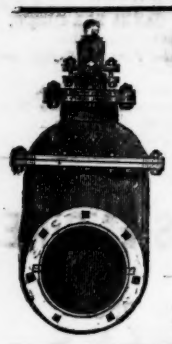
AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,

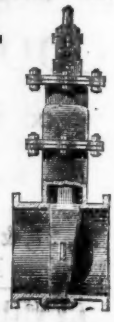
UP TO FOUR FEET IN DIAMETER.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

Warehouses: London, Liverpool, Manchester, and Lille.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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WAREHOUSE: SOUTHWARK STREET, LONDON.

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PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

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MANUFACTURERS OF

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PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

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AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

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SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists. It has the following qualifications and properties:—

EFFECTUALLY PREVENTS AND ARRESTS CORROSION.
HAS A FINE GLOSS, AND IS VERY DURABLE.
DOES NOT REQUIRE DRIERS LIKE OTHER PAINTS.
PROTECTS IRON FROM ACTION OF WATER.

IS NOT AFFECTED BY SULPHURETTED HYDROGEN.
FORMS A VERY HARD TOUGH (NOT BRITTLE) SURFACE.
WILL NOT CRACK, BLISTER, OR SCALE
IS NOT AFFECTED BY EXTREMES OF TEMPERATURE.

COVERS NEARLY DOUBLE THE AREA OF OTHER PAINTS.
(7 gallons or 1 cwt. will cover 1211 square yards of Ironwork.)
IS CHEAPER AND MORE ECONOMICAL THAN ANY OTHER.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

HYDRATED PURIFYING MATERIAL.

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GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

SAMUEL CUTLER & SONS,

CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF

GASHOLDERS, TANKS, PURIFIERS,

SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & Sons undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

1862.

HALLETT'S
PATENT ANTIMONY PAINT.

CLASS II.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

Price 30s. per Cwt. Special Driers supplied at same Price.

This light stone-coloured Paint, for which a Prize Medal was obtained in 1862, is free from certain defects of white lead. It does not produce any deleterious effect upon the health of those who use it, such as painter's colic, nor is it blackened by sulphur compounds in the atmosphere; while, from its less specific gravity and good body, it covers more surface, weight for weight, and, therefore, it is preferable and more economical than white lead.

It is peculiarly adapted for Gas-Works.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM; AND 85, SOUTHWARK ST., LONDON, S.E.

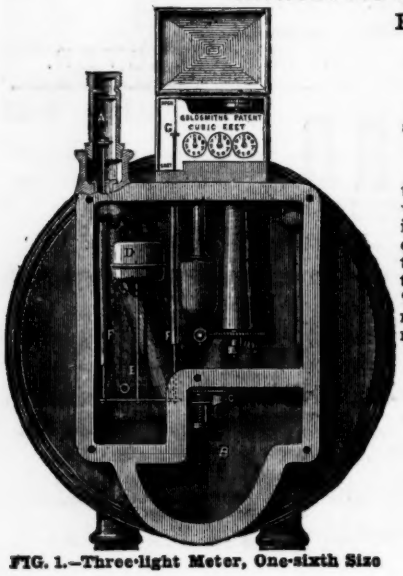


FIG. 1.—Three-light Meter, One-sixth Size

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

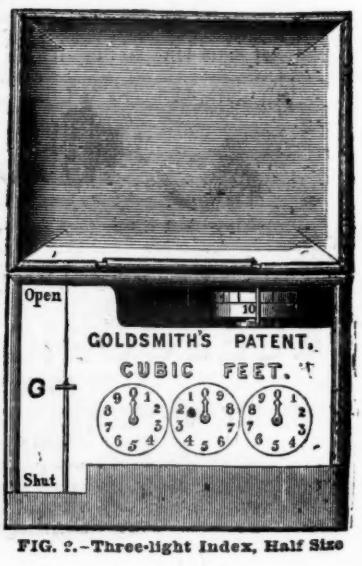


FIG. 2.—Three-light Index, Half Size

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

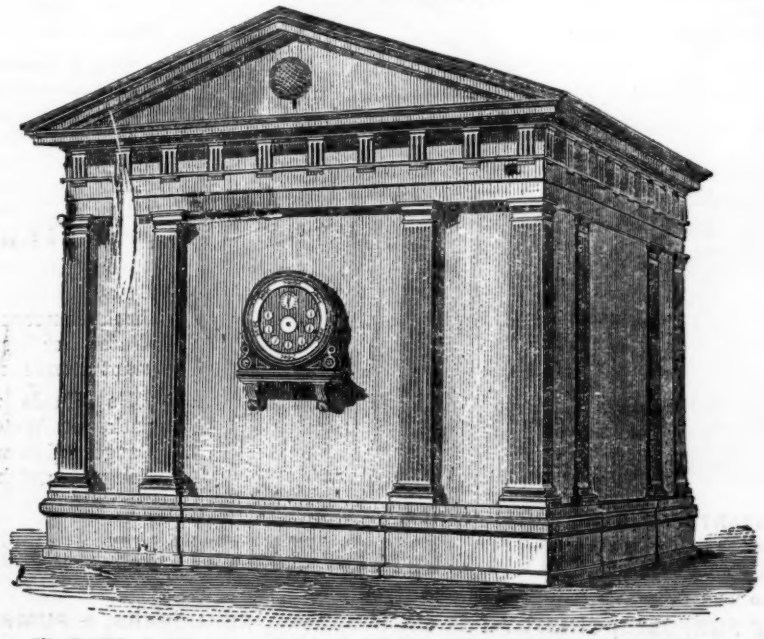
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

22, HERMES STREET, PENTONVILLE ROAD,

LONDON, N.

The Dunston Engine Works Co.,

GATESHEAD-UPON-TYNE.

Are the Sole Manufacturers of

Archer's Patent Hoists,

ALSO OF

Archer's Patent Stone Breaker, &c., &c.,

(As supplied to Sir Wm. Geo. Armstrong, C.B.),

AND OF

Archer's Patent Ore Crusher & Pulveriser,

Unequalled for the purposes of Mine Owners, Chemical Manufacturers, Cement Manufacturers, and others.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTER-MIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING

MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

LANCASHIRE.

Gold Medal Awarded, Paris Exhibition, 1878.

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SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNER RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES,

AND ENGINEERS TOOLS GENERALLY.

LONDON OFFICE:

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CAMBRIDGE STREET WORKS AND ROLLING MILLS.

BIRMINGHAM.

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The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners

MEDAL FOR PROGRESS, VIENNA, 1873.

The following Medals were also awarded at Paris, 1878:—

GOLD MEDAL for Chandeliers and Gas-Fittings.

GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

GOLD MEDAL (Rappel) for Art Metal Work. BRONZE MEDAL for Tube Metal and Wire.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes; Tin Tubes;

GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

GENERAL BRASSFOUNDERS.

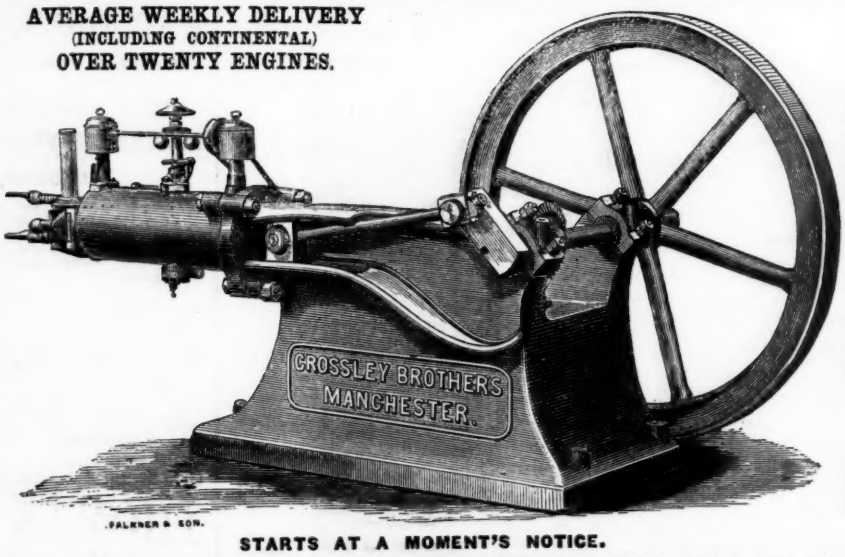
REGISTERED TRADE MARK:

LONDON OFFICES & SHOW-ROOMS: R. W. W. & CO. 141, FLEET STREET, E.C.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.



FALKNER & SON.

Over 1900 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877,)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. SIZES { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¾ 1½ 2½ 4 9 12 18 24 } OFFERED. CASES NOT CHARGED IF RETURNED FREE

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

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CROSSLEY BROTHERS, MANCHESTER.

LONDON HOUSE: 116, Queen Victoria St., E.C.

TANGYE BROTHERS AND HOLMAN,

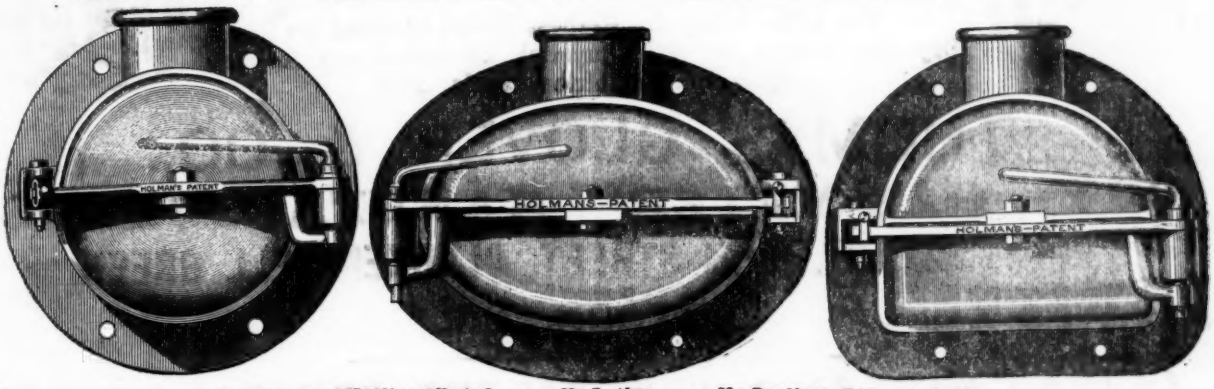
CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly itested, being now in use in nearly all the principal Gas-Works in London and the Provnces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

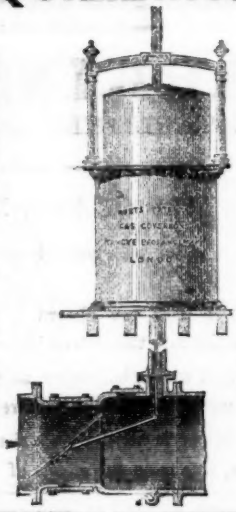
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

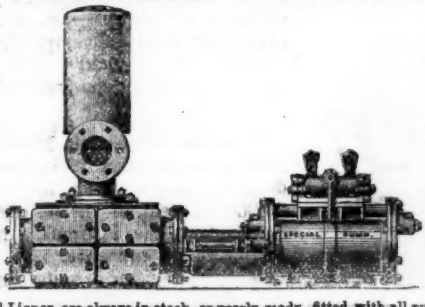
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,350*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851. New York. 1853. Paris, 1855. London. 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters bv the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

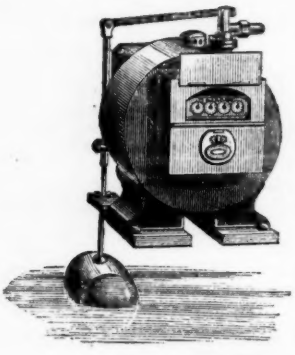
LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816.)



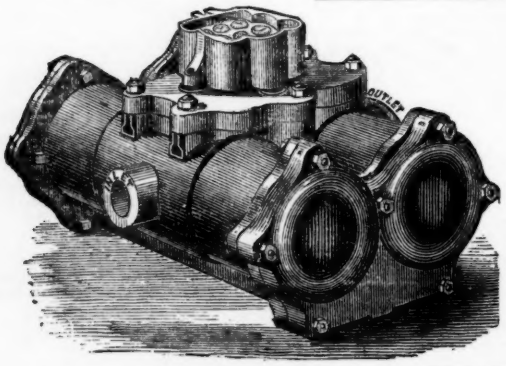
SOLE MAKERS OF THE LOW-PRESSURE WATER-METER.

This Meter will register with perfect accuracy, either at full speed, or with a few drops only passing through it.

It must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below.

Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



HIGH-PRESSURE WATER-METER.

The Union Water-Meter, of which an external view is here given, is of the positive class—*i.e.*, a Meter in which a measuring chamber is alternately filled and emptied, each filling being duly recorded. It is formed of two cylinders, with double pistons in each, having a rotary-valve of peculiar construction, which is worked from cams on the piston-rods.

It is claimed for this Meter, among its advantages over other Piston Meters in use, that it is extremely small and compact, and that its durability and accuracy have been proved by the fact that upwards of 20,000 of them, of various sizes, are in successful operation in the States. In England the instrument has been fully tested by several Water Engineers of eminence, and pronounced by them as a reliable and satisfactory register of water supply; it is also economical in cost.

ALL METERS are TESTED with 60 lbs. pressure before they are sent out.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO SUBSCRIBERS.

In consequence of the Whitsun Holidays, the next Number of the JOURNAL OF GAS LIGHTING *will not be published until Wednesday, June 4.*

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 27, 1879.

Circular to Gas Companies.

We were going to say that the proceedings of the Select Committee on Lighting by Electricity drag their slow length along; but, as a matter of fact, they practically came to an end on Friday last. On June 13 next another sitting will be held, at which it is understood that only one witness, Lieut.-Col. Haywood, the Engineer to the Commissioners of Sewers of the City of London, will be examined for a short time, and then the Committee will consider their report. We confess to having been exceedingly disappointed at the manner in which this inquiry has been conducted. The Chairman evidently entered upon it with a foregone conclusion, and, for the most part, converted the evidence into a series of attacks upon Gas Companies. The real question which was referred to the Committee to consider—viz., the advisability or not of imposing legislative restrictions on the production and distribution of the electric light—has been scarcely even touched upon. We have had plenty of evidence about the use of the electric light in lighthouses and on board ships, part of which, as our readers will see in time, has been of a somewhat contradictory character. But no legislation is necessary to enable the Trinity Board to employ the electric light wherever they think it advisable, nor in the regulations of the Board is anything more necessary to authorize the use of the light on shipboard. With regard to ships, there is something more to be said, for it was in evidence on Friday last that the captain of a steam vessel, employing a strong electric light, could not find his way into port, owing to the glare emitted from his lamp. When the light was extinguished, he got in all right. Admiral Collinson is, however, strongly in favour of the use of the light, especially in lighthouses, for which it is well adapted. Mr. Wigham's burners are, however, quite as effective, and are much more reliable, and the Admiral read out a long list of cases in which the electric light had failed—for short periods only, it is true.

Mr. Farrer, the Permanent Secretary of the Board of Trade, was equally emphatic in his recommendation of the light for certain purposes; but these appear to be of a very limited character, and ships may use them, but not in narrow, tortuous channels, in which the lights prescribed by the Board of Trade and the Trinity Board would be completely obscured by the dazzling glare of the electric light. It seems to have been made clear to the officials that the use of the light under ordinary circumstances would rather promote than prevent collisions. With regard to fogs, it is very well understood that nothing but the naked electric light will penetrate far. Unless our memory deceives us, it has been ascertained by Professor Tyndall that Mr. Wigham's most powerful burners penetrate much farther than the best electric light yet brought into use in lighthouses. Gas cannot, of course, be adapted for use on board ships. It might be done with ease, but it would involve the occupation of space which is required for other purposes. Mr. Farrer went on, and we may say out of his way, to make an attack on Gas Companies. It would have been in very much better taste if this part of the evidence had been altogether omitted. The conditions under which Metropolitan and other Gas Companies conduct their business have nothing whatever to do with the electric light. It would have been perfectly competent for Mr. Farrer to have proposed rules and regulations to control the production and the distribution of the light in our streets, but nothing of the kind was suggested. It would also have been easy to settle the relative rights of Corporations and Gas Companies to furnish the electric light, if it should ever become an useful invention. No suggestion of this kind, however, passed Mr. Farrer's lips. He contented himself with the simple assertion that Local Authorities should be endowed with all powers, and that Gas Companies should practically have none. Gas Companies, we know very well, have not a complete monopoly of the streets. Any one can lay down the necessary wires to supply the electric light, subject, of course, to the liability of indictment for nuisance, if any one were mischievous enough to proceed against the individual or company. It may be a grave question whether a Gas Company with statutory powers to supply gas, but with no parliamentary authority to furnish the electric light, could legally take up the pavement for the purpose of laying down a wire; but we feel certain that they would be held justified by the terms of their Special Act, which enables them to lay mains. Any Court of Law would decide that a gas-main to convey gas for illuminating purposes, and a cable to convey electricity for the same purpose, were equivalent in their meaning. There is not, we think, any necessity for Gas Companies to go to Parliament for an extension of powers to supply the electric light. We have not done with Mr. Farrer, for we shall have to refer to him again when we place his evidence before our readers. For the present, we shall content ourselves with noting with dissatisfaction the continued antagonism of the Board of Trade to commercial enterprise. Under *fainéant* presidence, Mr. Farrer reigns supreme; but the day may come when a mercantile man like Mr. Bright will become the President of the Board of Trade, and then perhaps commercial adventure will be allowed to follow its natural course.

Sir William Thompson, in his evidence on Friday last, carried the question into the clouds. He expressed an opinion that the electric light might to-day be applied to domestic illumination; but he did not tell us how. He gave as his belief that the light might be obtained by the expenditure of much less force than has hitherto been found sufficient to produce it. He thinks that every gentleman's house may have an electric light in the drawing-room, and any number of smaller lights about the premises, and what we may call the surplus heating power when the lights are not required, may be devoted to the supply of hot water to the house, and, indeed, the surrounding neighbourhood. This idea is extremely ingenious, and we shall look forward with some interest to its development. A hot-water supply to every house would, indeed, be an immense boon, if householders could only see their way to dispense with fires, which furnish the commodity. To the evidence of this gentleman we shall also have to return next week, when we hope to be able to lay it before our readers.

Mr. Michael, Q.C., brought us back to the real question in dispute, and his able statement put the matter very clearly before the Committee. As a legal gentleman of much eminence, he gave it as his opinion, in opposition to one obtained by the Liverpool Corporation, that Local Authorities could break up the streets for any purpose which was considered desirable. So far, then, no legislation is required to give authority to local bodies to lay cables for the supply of electricity for illuminating purposes. In the same way, it was argued that statutory Gas Companies had similar powers. They have the right to break up the streets, but for what express purpose, their Acts do not directly specify. Anything may be included in the vague language which is commonly employed. Mr. Michael was very

emphatic in the expression of an opinion that Local Authorities could do just as they please with roadways under their own jurisdiction; but there are, we think, decisions against him, which are not completely answered by the cases that he quoted. His evidence, however, was a triumphant defence of the rights of Gas Companies, and as such we receive it with much pleasure. It was a fortunate thing that such an important witness was kept back till the last, so as to leave an impression on the minds of the Committee, which, however, we fear, will be swayed by the opinions of the Chairman.

But what, after all, has been done as regards the real points at issue? Mr. Michael showed that Corporations and Gas Companies alike have power to break up the streets for the supply of illuminating agents. This, we think, is indisputable; but it only touches the threshold of the question. How, in the case of independent Electric Light Companies, shall their capital be limited? How can the illuminating power of the light they are to supply be fixed? How are the charges to be made? And what are to be the limits on profits? These are questions which ought to have been put before the Committee, but which were not, although coming within the scope of the inquiry they were directed to make. To Mr. Michael's evidence, of course, we must return when it is published. In the meantime, we have to thank him for his able vindication of the rights of Gas Companies, and all concerned in the supply of the commodity. As we have said before, this inquiry is happily coming fast to an end. It has, we believe, been utterly abortive, and what report the Committee can make is at present to us quite a mystery. A writer like Dr. Lyon Playfair can, no doubt, make much of it; but what practical ends may be suggested, it is very hard to guess. Most certainly the inquiry has been wide of the mark. It is not, perhaps, the fault of the Committee, for really so little is known at the present moment about the electric light, as regards its application to street and domestic illumination, that we cannot blame them for their meanderings.

At the last meeting of the Metropolitan Board of Works a report submitted stated that the Committee of the Board had, in reply to the communication from the Board of Trade, written to the effect that they entertained certain objections to the scheme for the amalgamation of the South Metropolitan and the Surrey Consumers Gas Companies; but it does not appear that any active opposition will be raised. The fact is that the amalgamation promises to be so beneficial to the consumers in the Surrey district, that we fail to see what objections can possibly be urged against the combination. That the Company affiliated to the South Metropolitan Company will be subjected, after twelve months, to all the pains and penalties imposed by recent legislation, ought to be sufficient to satisfy the most exacting member of the Metropolitan Board, and we are astonished that any remonstrance should be made against a scheme which involves so many benefits to a large section of the consumers of of gas on the south of the Thames.

There is, we are happy to know, a possibility of a much larger combination, into which the Phœnix Gas Company will enter. It is unfortunate that this Company has not been more prompt in responding to popular demands. A few years ago they might have taken the lead in a scheme intended to consolidate the interests of all the Companies south of the Thames; but they allowed the opportunity to slip, and now have to take what may be called a secondary position. Nevertheless, the combination must, if effected, prove of great value to the Shareholders. The undertakings worked together would yield profits which would admit at once of a reduction of price, and consequently an increase of dividend. The fact is gratifying to both Consumers and Shareholders. The combination we speak of is only *in posse;* but we entertain an opinion that it is certain to be effected, sooner or later. Every kind of amalgamation we regard with favour. We have had no hesitation in expressing an opinion that it would benefit all if the gas supply of the Metropolis were under one management, and we have constantly urged that if this could not be effected, the northern Companies might all be consolidated, and the southern Companies be in a similar manner constituted into one united body. The objections of the Board of Works will probably have no weight with the Board of Trade, who favour amalgamation, and therefore we take it that the scheme is certain to receive their approbation. As to the Phœnix combination, we shall probably soon hear more. We only hope that it will be proceeded with and soon carried out. A meeting of the Shareholders of the Surrey Consumers Company is called for to-day, to sanction the arrangement for amalgamation. We cannot suppose that any one would be so stupid as to raise an objection. The Company urgently require new works, and the infusion of new blood. They have not, at the present moment, any opportunity of increasing their storeage, although they have facilities for the erection of new carbonizing apparatus and the reception of coals. The combination, as we have said, will assist them in both particulars, and we cannot believe that any Shareholder will be led into the folly of opposing an amalgamation so desirable.

Mr. Thomas Bridge Simpson, the late Chairman of the Directors of the South Metropolitan Gas Company, who died on the 18th inst., deserves a passing notice. He joined the directorate of the Company thirty-two years ago, and for the last twenty-two years was the Chairman. Before the districting arrangements in the Metropolis were made in 1859–60, Mr. Simpson rendered essential service to the Company by inducing the Authorities of Southwark to admit the mains of the Company within their limits. Under the arrangements made by Mr. Sotheron Estcourt's Committee, the South Metropolitan Company lost the Borough district, but the temporary possession of it was of much value. Mr. Simpson was of a kindly disposition, and on disputed points loyally accepted the decision of the majority of his co-Directors, and earnestly endeavoured to carry them out. This made him a great favourite with his colleagues, and it is to be regretted that he has died at the juncture at which the South Metropolitan Company have now arrived. At the great age of ninety, Mr. Simpson, after a short interval of rest, consequent upon an attack of paralysis, has quietly passed away; but his memory will be long cherished by those with whom he was associated.

The sixteenth annual meeting of the British Association of Gas Managers will be commenced, at Newcastle-on-Tyne, on Tuesday, June 10, and the proceedings and festivities will be continued over four days. The programme is of a somewhat attractive character, the papers to be read embracing matters which are of extreme interest to Gas Managers, and which will command the attention of all the members. It would be invidious to select for special reference here any of the communications which will be presented; but we may speak of them in their entirety as all well worthy of notice. Under the able presidency of Mr. W. J. Warner, of South Shields, everything is certain to go well, and we anticipate a most agreeable and instructive *réunion*. The lecture will be delivered by Mr. G. A. Lebour, F.G.S., and his topic will be "Practical Notes on Coal "and Coal Getting." The North of England Association of Gas Managers display great hospitality on this occasion, and we are perfectly certain that the parent Association will derive much enjoyment from the liberality of their descendants.

In another column we publish a paper contributed by Mr. C. E. Jones, of Chesterfield, to the proceedings of the Midland Association of Gas Managers, who held their sixth quarterly meeting at Birmingham on the 1st inst. Mr. Jones's topic was "Public Lighting, with special reference to Streets, &c." There is no matter which deserves more important consideration from Gas Companies than the lighting of public streets. As a matter of fact, it may be said that the reputation of a Gas Company largely depends on the efficiency with which public lighting is performed. Unfortunately, the supply of public lights is not very profitable—indeed, in some instances, it involves a Gas Company in a positive loss; but it must be borne in mind that public lights, after all, constitute a sort of advertisement. The ratepayer who sees a brilliant illumination in the streets, and notices how small is the impost he has to pay for it, naturally concludes that to have gas in the house would be comfortable and economical. Mr. Jones goes into full details of the various requirements for effective lighting, and even the ornamentation of the pillars, and the exact position of the burner. On all these points we perfectly agree with Mr. Jones, and so also with respect to the use of more than twenty-candle gas, which he very properly says is of no advantage to the public. It only blackens ceilings, and causes careful housekeepers, at all events in the South, to anathematize the gas as impure. We wish, with the author, that Parliament would decide on some universal standard of quality. We have for many years insisted that fourteen-candle gas fulfils with efficiency all necessary requirements, and we are happy to see that, year by year, parliamentary sanction is given to this quality. The consumption of six feet per hour per lamp, recommended by Mr. Jones, we consider unnecessary, and it would not, we think, meet with the approval of many Local Authorities, who would consider it excessive, inasmuch as the Gas Company would have to add to their charges. We are sorry to find that Mr. Jones is not in favour of the "average "meter system," the adoption of which we strongly advocate. It is not that extra profit results to the Gas Company when it is employed, but, as a Member of the Association very pertinently remarked, it saves squabbles. But we have remarked on this above, and need say nothing more here. We have no doubt that Mr. Jones's paper will be perused with much interest, and we are certain with considerable profit.

Water and Sanitary Notes.

The Metropolitan Water Companies may be said to have been put on their trial by a side issue, when, on Friday evening last, Earl Granville called the attention of the House of Lords to the Metropolitan Fire Brigade and the report of the Commons Committee of 1877. The noble Earl graphically sketched the complexity of the system which exists for the protection of life and property in this Metropolis. With two Police forces under separate management, a Fire Brigade under a totally different authority, and eight Water Companies with distinct supplies and no unity of management, it is alleged with some degree of force that, taken as a whole, the Metropolis is very inadequately protected. With the Police force and the Fire Brigade we have nothing to do. With respect to the Water Companies, it is another matter. We are perfectly aware that they are quite capable of taking care of themselves, and nothing detrimental to their interests is ever likely to receive the sanction of any but a revolutionary Parliament. Lord Shaftesbury tried his hand at confiscation in 1852, but the Companies were too strong for him, and the General Board of Health, of which he was President, went to the wall, and, as he mildly put it, "ceased to "exist." Any authority which attempts to-day to do what Lord Shaftesbury wished to accomplish, will share the same fate. Confiscation in no sort of shape will be accepted by Parliament. The Water Companies, as we have often said, may be bought up at their proper value; but why should the undertakings pass from the hands of the Companies? All that was urged in the House of Peers on Friday night was the necessity for unity of management, which, as we have persistently striven to enforce on the minds of the Directors of the several Companies, can best be effected by amalgamation. No body of persons are so competent to direct the affairs of the Metropolitan water undertakings as a select body of Directors and Engineers who have had long experience in the conduct of water affairs in past time.

Two other questions cropped up in the course of the debate. One was the necessity for a constant supply of water and the liberal distribution of hydrants. With regard to the former, we fully grant that it would be advantageous to everybody concerned; but it must be remembered that a good deal would have to be done to houses before they could be made fit for a constant supply under pressure. The cost of these has been variously estimated, and possibly exaggerated; but there can be no question that, to make our habitations fit for the reception of water under pressure, many alterations in the fittings would be required. The expense of these has perhaps stood in the way of the general adoption of the constant service in certain parts of the Metropolis. The next question is that of hydrants. It must be remembered that the single obstacle to the general adoption of hydrants all over the Metropolis is the supineness of the Metropolitan Board of Works, who have discouraged every effort which the Water Companies have made to fulfil a much-desired want. We have no fear that, even with our admittedly imperfect arrangements for the extinction of fires, another great "Fire of London" will ever occur. The nonsense talked on this subject is palpable and puerile. Those who utter it are strangely forgetful of the vast change which has taken place in the street arrangements of the Metropolis since 1666. There are now, even in the most crowded parts of the City of London, few thoroughfares which are not easily accessible to the Fire Brigade. With the introduction of hydrants, which the Corporation have so freely supplied, the risk of the extension of any fire has been enormously diminished, and it may, we think, be said, with truth, that any large conflagration is impossible without the aid of incendiarism. In the poorer districts—take for example Bethnal Green and Spitalfields—it is almost impossible for a large conflagration to break out. One or two manuals could successfully cope with any fire likely to occur in those districts, and there is this to be said further, that there is no inducement for any one to promote a large destruction of property in those districts. We may then, we think, dismiss from our minds the probabilities of the risk of another great Fire of London, and turn to the other point which was brought prominently before the attention of the Peers. It is the statement that the Water Companies have largely increased their charges since the last valuation of property was made. The question of the legality of this proceeding appears to have been disputed; but we may take it as a fact, that every Water Company has power to charge rates according to assessments. But have they exercised the power conferred on them by their special Acts? We have made inquiries, and can find but few instances in which an increase has been charged in domestic rates. There are, of course, cases in which additions have been made to premises in which large consumption of water is calculated upon; but, taking the Metropolis throughout, we believe the rates will be found to remain very much as they were five years ago.

The proceedings of Friday night are certain to bear fruit of some sort. It was almost promised by the Duke of Richmond and Gordon that the Government would, at some time or other, when it was thought convenient and fitting, deal with the subject of the Metropolitan Water Supply, and presently, when Earl Camperdown brings forward the motion which he has threatened, we may perhaps learn something more of the views of the Government. At present all is hazy. No one seems to see his way to a change which would benefit the community. There is no body in existence, it is admitted, which can safely be entrusted with the control of the water supply of the Metropolis. The purchase of the undertakings by the Government, as Earl Camperdown seemed to suggest, would never be approved. There is really no analogy between the purchase of the Telegraph Companies and that of the Metropolitan Water Companies by the Government. The former fitted into the Postal system, and has become part of it; but where would the Water Companies fit in? If it be proposed to go on allowing the Government to purchase commercial undertakings, where will it end? They may buy up all the railways in the kingdom, and they might, if such proceedings are to be carried on, also buy up all the water undertakings not in the hands of Local Authorities; but this the country would not bear. The functions of Government are limited, and, although the purchase of the Telegraph Companies rather rudely broke in upon the accepted notions of the propriety of Government engaging in commercial pursuits, the thing has been done, and we must take results as they are found. But *revenons à nos moutons*. All that is demanded with regard to the Metropolitan Water Supply can, as we have observed above, be done and settled by the Companies themselves. We are glad to see that nothing was said in the House of Lords as to a want of sufficiency in supply, and very little about the quality. The fact is we have a superabundant supply, and that the quality is excellent is proved by the healthiness of our population.

The report of the Directors and the accounts of the Lambeth Water-Works Company, for the half year ending March 31, 1879, have been issued in anticipation of the ordinary half-yearly meeting to be held to-day. The accounts show an extremely favourable state of affairs, and the Directors propose to distribute a dividend of 6½ per cent. An augmentation of capital is necessarily proposed—a fact which will irritate the enemies of the Companies, who are anxious to buy them up at a low price. It is, however, absolutely necessary that new capital should be raised to meet the ever-growing wants of the district supplied by the Company. It is further proposed to convert a considerable sum of borrowed money into share capital—a perfectly legitimate operation, but one which entails an additional charge on the fund applicable to dividends. We may congratulate the Company on the progress made with their new filter-works. That the present filter-beds may be efficient, is admitted by Dr. Frankland in his last report; still, in view of the extended supply which must be furnished, the additional works will be valuable accessories. We are happy to see the constant supply system is being extended in the Company's district, and are not at all surprised to find that they have had a difficulty in persuading the tenants to put their fittings in order to receive such supply. The Company are also doing well to employ Mr. Deacon's waste-meters. It is really melancholy to reflect that at least one-third of the water supplied in this Metropolis runs to waste. That waste must, in some way or another, be stopped. It would not be endured if the water undertakings were, say, in the hands of the Metropolitan Board of Works, who would be sure to keep a tight reign on the consumers. We are sorry to see that Mr. J. Taylor, the able Engineer to the Company, is taking notice of the stupid correspondence addressed to a local paper. Our advice would be to treat all such things with the contempt they merit, and leave what excitement they produce, if any, to die out. It is most probable that an extremely small number of people take the trouble to read the lucubrations of the correspondents who abuse the Water Companies, and for this reason it is needless to take notice of the letters addressed to local papers.

The Water Committee of the Corporation of Liverpool have not yet agreed upon a scheme for the future supply of water to their borough and the neighbourhood. They have at present three water schemes before them. There is, for example, the Vyrnwy scheme, which would furnish them, at what may be estimated a moderate cost, with an excellent supply of pure and wholesome water. But, in our opinion, the scheme would have to encounter so much opposition, that there would be little chance of carrying it through Parliament. There is, further,

the Haweswater scheme, which has not, perhaps, been sufficiently considered; and there is also a proposal to share with Manchester the supply from Thirlmere. This last proposal is looked on only as a temporary expedient; but if it were regarded as intended to furnish a permanent supply to Liverpool, we think a little alteration in the plans of the Manchester Corporation would adapt it for providing a sufficiency of water for long years to come. Failing an arrangement with the Corporation of Manchester, which it is desired to make, we cannot help thinking that Haweswater offers the best source for an independent supply. But we are anticipating. In a few days we shall receive a complete report of the recommendations of the Water Committee. At present, the members seem equally divided in their opinions as to the advantages of any one of the schemes; but further consideration will, no doubt, assist them to shape their thoughts, and within a fortnight we hope to be in a position to report that the Committee have agreed to recommend to the Town Council a scheme which will receive their entire support.

The Local Authority of Colne (Lancashire) are not on the best terms with the Water Company. They complain of an insufficient supply of a not very pure water, and would, if they could, purchase the undertaking; but the Company stand rigorously out for their own price. The undertaking might have been had for £12,000 in 1876; but now, in consequence of further expenditure of capital, the value of the works is estimated at £14,500. There is a talk of the Board applying to Parliament for power to supply water to themselves; but it ought to be made clear to them that neither the Local Government Board nor Parliament will grant authorization for the competition of a Local Authority with an established Water Company.

Extension of Storeage at the South Metropolitan Gas-Works.—There has recently been commenced, at the works of the South Metropolitan Gas Company, a tank 216 feet in diameter, and 53 ft. 6in. deep, intended for the reception of a three-lift holder to contain 5¼ million cubic feet of gas.

The Water Supply of Skegness.—The boring operations which have of late been carried on at this Lincolnshire town have proved very satisfactory. Two tubes, 6 inches in diameter, have been sunk, and yield from 3000 to 4000 gallons per hour each, the overflow being about 1 foot above the surface. The water rises from the lower portion of the upper greensand. Dr. Voelcker, who has analysed the water, states that it is suitable for general domestic purposes.

Sale of Guildford Gas Company's Shares.—On Saturday, the 17th inst., 53 shares in the Guildford Gaslight and Coke Company were sold by auction, at the following prices:—Seven paid-up £25 shares, bearing a dividend of 10 per cent., were bought at the rate of £50 per share. Seven £3 shares, dividend 5 per cent., sold for £25. Twenty £10 shares, 7½ per cent., were purchased by Mr. W. Longworth, the Manager of the works, at £15 each. Two lots of two £10 shares, 7 per cent., realized £30 each lot. Eight similar shares were bought for £80, five similar shares for £70, and two more of the same class, £29.

The late Mr. J. Johnson and the Freemasons.—At a meeting of the "Evening Star Lodge, No. 1719," this evening, it will be proposed—"That the members of this Lodge, having heard with deep regret that the widow of our late brother John Johnson (a subscribing member of this lodge) is, through the death of her husband, left in straitened circumstances, do pledge themselves to use their votes and interest to secure the admission of her two youngest children (a boy of nine and a girl of seven) into the Masonic Schools, and that the whole of the votes given be used for the election of the boy first, and for the girl after the boy's election is secured." We mention this as no doubt many of our readers, who are subscribers to the Schools, will be glad to assist with their votes, which may be sent to Mr. Magnus Ohren, Secretary of the Lodge, Lower Sydenham, S.E.

The Effect of the Electric Light on the Eyes.—According to the *British Medical Journal*, Professor Cohn, of Breslau, has been lately making experiments with the electric light on the eyes of a number of persons, for the purpose of testing its influence on visual perception and the sensation of colour. He has found that letters, spots, and colours are perceived at a much greater distance through the medium of electric light than by day or gas light. The sensation of yellow was increased sixtyfold compared to daylight; of red, sixfold; and of green and blue, about twofold. Eyes that could only with difficulty perceive and distinguish colours by daylight or gaslight were much aided by the electric light, and the visual perception was also much strengthened. Professor Cohn concludes from this fact that electric light would prove exceedingly useful in places where it is desirable that signals should be seen at a distance.

Improved Value of Gas Shares in France.—Following upon the recent successful illumination of the Rue du Quatre Septembre by an improved system of gas lights, a marked advance has taken place in the value of the Paris Gas Company's shares, which were recently quoted at 1235 frs., their nominal value being 250 frs. only. On these shares, as recorded in the number of the Journal for the 6th inst., a dividend of 65 frs. will be paid for the year 1878. Shares in the other French gas companies are reported to be in a correspondingly satisfactory condition; those issued at 500 frs. being quoted at premiums ranging from 85 frs. to 135 frs. and 150 frs., and several other examples might be quoted. The financial journal *Le Revenu*, in advising its subscribers to embark their capital in these securities, remarks that gas companies have now no longer any competition to fear from the electric light, and that there is in store for new shareholders a brilliant and prosperous future. Just now there appears to be a run on gas shares; and consequently, they are not to be easily obtained. This, says the *Moniteur de l'Industrie du Gaz*, is not astonishing, seeing that these shares regularly produce dividends of rom 6 to 15 per cent., while examples are not rare where even as much as 30 per cent. has been paid. However suitable the electric light—which it has been sought to set up in opposition to gas—may be for the illumination of certain localities, nothing can replace gas as a light-giving agent generally applicable, and one moreover that is obtainable at a price considerably below that of the electric light.

THE CONSUMPTION OF GAS.

The unusually small percentage of sunshine with which London has been favoured during the past winter, in comparison with the total possible amount, must be supposed to have exercised a proportionate effect on the demand for artificial light. This may help to explain the growth in their gas bills, of which some people have been complaining. How far the spirit of complaint extends, we cannot tell. We only know that a good many letters on the subject have appeared in the columns of the *Daily Telegraph*; but when we consider how great a show some half-dozen letters a day will make in the columns of a morning paper, and how exceedingly small is the entire number of the complainants, when contrasted with the myriads of gas consumers in the Metropolis, we are led to infer that the dissatisfaction may be very much less than mere appearances would indicate. In the next place, let the dissatisfaction be what it may, it is easy to see that it lacks that foundation which is necessary to make it formidable. In many cases, we should hope, the dissatisfied consumers might be persuaded to listen to reason, instead of holding to those exaggerated notions which they are very often encouraged to entertain. The Press, too ready, in some instances, to take what appears to be the popular side, is responsible for encouraging the most outrageous and ridiculous ideas with regard to the circumstances of the gas supply. The Local Authorities, who think that if they had the gas supply in their own hands, all would be right, may take warning by the fate of the Gas Companies. Whether the gas be supplied by a Company or by a Municipal Authority, dissatisfaction will still arise, and consumers will be found to declare—among other points of grievance—that they are charged for a quantity of gas far in excess of their actual consumption.

It seems to be inherent in human nature to complain of the gas supply. There is always too much sulphur, not enough light, and some suspicion attaching to the meter; the pressure is too great, or is altogether insufficient. At all events, there are always some people to say these things, and there always will be; and one grumbler produces a much greater sensation than a hundred contented people. The recklessness of the agitation which is sometimes got up on this subject is illustrated by the unsuitable title with which the *Daily Telegraph* has headed its correspondence relative to the present circumstances of the gas supply. The "Price of Gas" is the title, which has really nothing to do with the burden of the complaints. One of the letter-writers has himself pointed this out, saying, "There is no "difficulty about the price of gas, as, in consequence of public "agitation, it was reduced to 3s. 6d. per thousand, which is "perhaps reasonable." "The real grievance," says the writer, "is that the consumption of gas is monstrously increased." According to some of the correspondents, the gas registered has been increasing for some time past at such a rate that they believe they are paying for more gas than they actually burn, to the extent of twenty-five, fifty, or even one hundred per cent. It is contended that the Companies are supplying gas at high pressure, in order to keep up a big flame in Sugg's new street-lamps, and that this "compressed gas" expands in the meter, so as to double its volume and increase the amount registered. Another notion runs exactly the opposite way. It is alleged that the Companies are mixing air with their gas, thereby giving their customers a compound of "wind and smoke." One gentleman at Kingsland says: "We are paying 3s. 9d. per thousand for con-"suming air." We question whether he is paying 3s. 9d. per thousand at all, and we are quite sure that if there is any air in the gas, it is not the will of the Gas Company that it should be there. It is a pity that the A B C of gas manufacture is not more generally known. As little as one per cent. of air would reduce the lighting power of the gas by six per cent. This would have the effect of making 17-candle gas appear as 16-candle gas. Two per cent. of air would reduce the lighting power by as much as eleven per cent., thus reducing 17-candle gas to little more than 15 candles. Remembering that in respect to the greater part of the gas supplied in London, a certain standard of lighting power must be maintained, or a heavy fine will follow, it will be seen that the slight gain in bulk would never compensate for the loss in the illuminating quality consequent on the introduction of air. As little as seven per cent. of air would reduce the lighting power of gas more than one-half, rendering it totally insufferable. If the Companies thought it possible to evade the official test as to lighting power, their better plan would be to supply poor gas at once, instead of first of all making good gas and then spoiling it.

One writer thinks he has hit the mark by pointing out that when he wants to light his gas, he finds so much air in the pipes that he has considerable difficulty in getting the gas to light at all. No doubt this gentleman is in the habit, like most

gas consumers, of turning off his gas at the meter. If he will desist from this practice, he will experience no difficulty in lighting his gas, and he will escape a fruitful source of peril. At the moment when the gas is turned off at the meter, it may happen that there is a jet of gas burning somewhere on the premises. This, of course, goes out when the supply is turned off, and if the position of the tap is not noticed, there is a rapid escape of gas the next night when the gas is turned on, unless the said burner is at once re-lighted. Many disasters happen from this cause.

A broad test may be applied to the extraordinary statements which are now passing current. If the quantity of gas registered at the consumers meters is so largely in excess of the actual quantity of gas consumed, the result must show itself in the half-yearly accounts of the Gas Companies, and will come out very vividly in Mr. Field's yearly "Analysis." Hitherto the "gas made" by the London Companies has exceeded the "gas sold" by at least six per cent., after allowing for the quantity consumed at works and offices. The six per cent. represents gas "unaccounted for," and is a dead loss, occasioned by leakage, and, perhaps, to some slight extent, by fraud. The "gas sold" in London in the year 1877, including the public lamps, was a little under ninety-three per cent. of the quantity made. If now the Companies were able by some jugglery—whether by increase of pressure, introduction of air, or trickery with the meters—to charge for even as little as ten or twelve per cent. more than the actual quantity of gas consumed, there would no longer be an excess of the quantity made over the quantity sold, but the balance would incline the other way. We need hardly ask whether any gas manager ever yet sold more gas than he made! If ever such a feat were accomplished, and the fact became known, we venture to predict that the attention of every Gas Company in England would be arrested by the circumstance.

Those persons who entertain the notion that the bulk of gas can be exaggerated in its passage through the meters of the gas consumers—otherwise than by accident, in some isolated case—must have a very imperfect idea of the vigilance with which the Gas Companies themselves watch over the proportion between produce and sale. Gas managers are watching each other to see what is the result obtained from a ton of coal in different works. If a manager should make it appear that he was getting 11,000 cubic feet of gas out of a ton of coal, while others were only getting 10,000, an inquiry would follow, which would very soon detect the fact if he were adventurous enough to make this pretence in order to hide a fraud practised on the public. We say this in case it should be urged that the alleged quantity of "gas made" is not to be relied upon. The statistics of gas-making are too well known and understood in the profession to admit of any deception in this matter. It is the very gist of the complaints in the *Daily Telegraph* that the consumption of gas has risen "lately." If the consumer is being imposed upon in this way, the result must show itself in the Company's accounts. These accounts, moreover, are carefully examined by a Government Auditor, who would infallibly detect any abnormal feature.

There seems to be an idea in some quarters that the gas is being supplied at an extreme pressure, so that it is only half consumed, and a great part is wasted at the burner. But it should be understood at once that the Companies have no interest in putting on an excessive pressure. On the contrary, it is to their interest to moderate the pressure, so as to reduce leakage. With a great pressure, not only is there an increased escape from defective joints in the mains, but there is a force at work to produce fresh leaks. So clearly has this point been apprehended, that the Legislature has always specified a minimum pressure, leaving the Companies to put on more if they thought proper, it being considered quite certain that they would not err in that direction. Moreover, if the pressure should happen to become excessive, the consumer has it in his power to protect himself, one simple method being to turn the gas partly off at the meter. It may be a question, perhaps, how far the recent complaints arise out of the use of unsuitable fittings. Any attempt on the part of the Gas Companies to interfere with the consumer's fittings is generally resented; but a little good advice, if only it were accepted, might be of great service to the parties concerned. If consumers were to furnish themselves with some well well-accredited "Handbook" on the use of gas, they might be all the better for it. Assuredly they would gain more in this way than by writing wildly to the newspapers, appealing to editors who are only too ready to believe that Gas Companies are capable of almost any enormity. One of the weekly journals starts a theory having for its basis "two very remarkable facts—namely, that it is only in the "Chartered Company's district these complaints have originated, "and that it is only since the meters have been changed that "they have arisen." Considering the enormous extent of the area supplied by the Chartered Company, it is no marvel if the majority of the complaints come from their district. But we must observe that in several instances the letter-writers in the *Daily Telegraph* do not give any clue as to their locality. In other cases the complaints have nothing whatever to do with the district of the Chartered Company. Some are from the provinces, and others from districts south of the Thames. It is also noticeable that all the letters are not antagonistic to the Gas Companies. One consumer states that he traced an increase in his gas bill to the use of "patent burners." Another shows very clearly that, by some defect in his meter, he paid for a much smaller quantity of gas than he consumed. As for the idea that the complaints arise out of a recent change of meters, it is shown that in 1860, or a little earlier, there was "much dis-"cussion and dissatisfaction in Liverpool," "people asserting "that, although the Company had lowered the price of gas, still "the bills when they were sent in were higher than they used "to be." It is nothing new for a discussion of this kind to be set on foot.

There is one thing worthy of consideration in reference to this subject, which may very easily be overlooked. The human eye seems to accommodate itself to an increasing amount of artificial light, and even to demand it. The introduction of the electric light, though at present very partial, is likely to have an effect in this direction. People who have seen the dazzling lustre of a powerful light will be ready to indulge in a freer use of gas. The ease with which gas may be turned on, so as to give a stronger light, is a temptation to this kind of indulgence. The student who is accustomed to use a couple of sperm candles is not likely to increase the number to three. An oil lamp, also, is a little refractory. But with gas it is quite possible to have a stronger light than formerly, without being conscious of the fact. When the collector calls for the money, then comes a dispute as to the measurement. Assuredly, if there is any adequate foundation in fact for the majority of the letters in the *Daily Telegraph*, the truth must be apparent when the Companies make out their next balance-sheets. But it is very difficult to satisfy those who are disposed to complain. If the quantity of gas sold bears a fair proportion to the quantity made—this again being tested by the weight of coal carbonized—it will perhaps be alleged that the gas has been wasted at the burners by extravagant pressure. For such a result, however, the consumer may blame himself, seeing that he can guard against any mischief of that sort, supposing it to exist, which is nevertheless far from likely. The idea that the electric light will end all dispute as between the producer and the consumer, is fondly entertained in some quarters. How this is to be, we know not. If a gas-meter is a "semi-barbarous machine" which nobody can understand, except the officers of the Company, what reason have we to expect that the British public will comprehend a machine which is to register the passage of electricity? If the rudiments of the gas supply are too recondite for the average householder, what will be the fate of the latter when he hears of "volts" and "ohms"? But the issue is a distant one, and, ere it comes to pass, many a brilliant leader will be indited in Peterborough Court by the aid of sixteen-candle gas.

THE EXAMINATION AND ANALYSIS OF COAL GAS.*

This book is written to instruct gas managers and others, who, ignorant of the art of photometry and of coal gas analysis, are anxious to become acquainted with it; and, at the same time, it forms a sort of *vade mecum* to those who, acquainted with the art, sometimes require their memories to be refreshed, especially in the matter of calculations and tables. Experienced analysts may not possibly require to be informed on all the points embraced in the book, but we may assure them that they will find in its pages all they may require to support, if not assist them, in the conduct of their operations. It also contains instructions which, if carefully carried out, will enable a gas manager or any gas examiner to make a full and complete examination of gas, whether for photometrical or analytical purposes.

The book is divided into three sections. The first is devoted to the art of photometry, which is described in a most effective manner. No manager can go wrong in adopting the practice recommended. The rules laid down are most complete, and will commend themselves to the attention of even experienced photometrists. Mr. Hartley, like ourselves, is an advocate of the use of candles for ascertaining the illuminating power of gas. There is, in fact, at the present moment, no other standard so applicable. Candles, of course, do not burn uniformly, and the best can seldom be persuaded to burn 120 grains per hour. It is, therefore, necessary to make a rule-of-three sum to ascertain what the actual illuminating power of the gas may be in relation to the candles. We know very well that a simple

* "Gas Analyst's Manual." By F. W. Hartley, A.I.C.E., M.S.E., &c. London: 55, Millbank Street, S.W. 1879.

sum in proportion does not show with much accuracy what the actual value of the gas may be in relation to the candles; but we have always contended in the JOURNAL that for commercial purposes it sufficiently approximates to accuracy. We are, of course, supposing that the examiner observes all the precautions which Mr. Hartley lays down in is book and quotes from the Instructions of the Metropolitan Gas Referees. The next section relates to the discovery and estimation of impurities, the methods for which will be found very fully described. This is followed by a section on the practical analysis of coal gas—not complete, of course, but quite sufficient for the ordinary requirements necessary for commercial purposes. The ultimate analysis of gas necessitates the use of processes which can only be conducted by skilled chemists. These would, of course, be inapplicable in the case of gas managers, who, as a rule, we may say without offence, possess but a limited knowledge of chemistry. It is not, however, necessary that an ultimate analysis should be effected. It may or may not be worth knowing the amount of hydrocarbons present condensable by bromine or chlorine; but it is more important to know the volume of carbonic acid and the amount of atmospheric air as represented by the volume of oxygen found. These points having been determined, the coal-gas analyst may rest on his oars, and consider his work done. If more be required of him, he must go to a skilled chemist, who will make the complete analysis which may be desired.

Specific gravity is not now regarded as of much value in estimating the worth of illuminating gas. Still Mr. Hartley has been at pains to write an interesting chapter on the subject, which we may commend to the notice of our readers. He gives careful attention to the question of the gravities of moist and dry gas. All these things are well worth knowing; but, happily, they seldom or never require practical demonstration. They may some day, when we are called upon to desiccate gas for the purpose of removing naphthalene; but at the present time the specific gravity of gas, moist or dry, may be considered of little moment. It is none the less praiseworthy that Mr. Hartley has worked up this question so fully, and shown so completely the influence of moisture.

An appendix to the work, containing some succinct rules for the guidance of the examiner, will be found of great value to those who are starting in the practice of photometry. A very useful set of tables are also appended, the nature of which our ordinary readers will fully appreciate.

In conclusion, we may express full approbation of the contents of this work, which we can recommend to all who are anxious to be instructed in the art of photometry and the ordinary analysis of coal gas.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLXXXI.

THE TREATMENT OF RESIDUAL PRODUCTS.

PICRIC ACID [$C_6 H_3 (NO_2)_3 O$].

This substance, which is used for dyeing silk and wool, has, at various times, been known by a great variety of names; amongst others, carbazotic acid, nitropicric acid, nitrophenisic acid, chrysolepic acid, trinitrocarbolic acid, trinitrophenic acid, trinitrophenol, and several others. It is, as will be seen from the formula, phenol in which three atoms of hydrogen are replaced by NO_2.

It is produced from a great number of substances by boiling them with nitric acid; for example, phenol, indigo, the resin of *Xanthorrhœa hastilis*, phlorizin, aloes, silk, gum benzoin, &c. It is, however, now always prepared on the large scale by the treatment of phenol with strong nitric acid. Pure crystallized phenol should yield about its own weight of picric acid.

When the action of nitric acid on the phenol is finished, the solution may be neutralized by carbonate of potassium. The picrate of potassium, although readily soluble in boiling water, is comparatively insoluble in cold water. The picric acid may be obtained from the potassium salt by boiling it with water and a slight excess of hydrochloric acid. The picric acid will crystallize out on cooling.

On the large scale, the readiness of picrate of potassium to crystallize gives rise to much inconvenience, as, in spite of every precaution, it stops up the filters. This difficulty may be overcome by neutralizing the first crude liquor with carbonate of sodium. Great care must be taken to avoid excess, as in that case nitrated resinous impurities would dissolve, and cause trouble afterwards. The boiling solution is to be filtered, and more carbonate of sodium is to be added. This will facilitate the crystallization of the picrate of sodium, as it is only slightly soluble in the presence of an excess of carbonate of sodium. The picrate of sodium is to be dissolved in boiling water, and excess of sulphuric acid is to be added. On cooling, nearly all the picric acid crystallizes out, as it is almost insoluble in solutions containing acid sulphate of sodium. The product thus obtained, after draining and washing with a little cold water, may, after drying, be considered as pure.

Picric acid, as found in commerce, is generally in the form of pale yellow scales. When pure it melts, according to Körner, at 122·5° C. =252·5° Fahr. It dissolves in 86 parts of water at 15° C. = 59° Fahr. If one part of picric acid be dissolved in 30,000 parts of water, and looked at in a stratum 1 inch deep, the liquid will appear distinctly yellow. The solution dyes wool, silk, and other animal tissues a bright yellow colour, but cotton, hemp, and flax are unaffected; animal and vegetable fibres may thus be distinguished from each other.

M. John Casthelaz, an eminent manufacturer of chemical products, has devised an apparatus which he terms a picricometer, for determining the relative degrees of purity of the various classes of commercial picric acid. The mode of operating is too long for insertion here; his paper will be found in the *Chemical News* for March 22, 1867.

Picric acid, rapidly heated in a retort, melts, boils violently, and frequently explodes. Some of the salts of picric acid are eminently explosive under the influence of heat, and sometimes by percussion. The writer once had a narrow escape with his life under the following circumstances. A mixture of picric acid with carmine of indigo (sulphindigotate of potassium) was undergoing the process of pulverization in a wooden cylinder containing cannon balls. The end of the cylinder was closed with a sliding trap or door of iron-plate. Feeling that the operation was not altogether free from danger, the writer placed his hand every few minutes on the iron-plate, to assure himself that no heating was taking place. Finding that the hand was insufficiently sensitive to a small rise of temperature, he placed his lips against the iron-plate, but no distinct evidence of heating was perceptible. He then turned aside to leave the room. At that instant a violent explosion took place, the cylinder was destroyed, and the iron-plate before alluded to was blown through a brick wall 40 or 50 feet from where the cylinder formerly stood. This incident is mentioned to show that reasonable care should be taken in working with picric acid and its salts, especially on the large scale.

Fabrics dyed with picric acid withstand the action of light, but are reduced in colour on washing with soap.

Fritzsche has made the remarkable discovery that picric acid forms crystalline compounds with benzene, naphthalene, and several other hydrocarbons. Picric acid forms beautiful salts with many of the organic alkaloids.

SLUDGE.

The term "sludge" is applied in some tar-works to the strongly acid tarry fluid which is formed in the treatment of coal naphthas by sulphuric acid during the process of purification (see p. 270 of the present volume of the JOURNAL). That the composition of the sludge must be very complicated is evident from the following considerations. In the first place, it contains not only ammonia, but all the alkaloids distilling at or near the boiling point of the rough naphtha from which it has been obtained. It will also contain the products of the action of monohydrated sulphuric acid upon all the homologues which are present of olefiant gas, benzene, and phenol. It has been lately asserted that ethylic alcohol is present in coal naphtha, and, if that be the case, other homologues may exist in it; and, consequently, we may expect to find in sludge the products of the action of sulphuric acid on those substances. Probably there are also compounds of naphthalene with the acid. It will be at once evident, from what has been said, that a complete investigation of the constituents of sludge would be a work of enormous labour. In fact, the examination of the volatile bases present in naphthas, and removable by acids, occupied the writer for several years; and this is probably the least difficult part of the subject, inasmuch as the alkaloids form definite compounds with numerous other substances, and these are capable of separation and identification with far greater ease than the products of decomposition of the compounds of the coal tar hydrocarbons with sulphuric acid. The following account of a few experiments on the non-basic constituents of sludge must, therefore, be considered as a mere outline; it shows, however, that a wide field remains for future research.

When the sludge from the light naphthas is distilled with water, or in a current of steam, a considerable quantity of oil is obtained. This oil has a peculiar and most offensive odour, which adheres with considerable tenacity to the hands and clothes. The repulsiveness of the smell is increased by distillation. At this stage the oil readily blackens paper moistened with acetate of lead.

Boiling with acid chromate of potassium and sulphuric acid entirely removes the smell. Digestion for a week over sodium lessens the odour, but does not entirely remove it. Distillation with sodium causes the smell of the sulphur compounds to disappear, but the peculiar and characteristic smell remains. A small portion previously digested in the cold with sodium for a week was rectified over that metal. Two fractions were obtained—(1) Boiling below 100° C. = 212° Fahr.; and (2) boiling between 100° and 110° C. = 212 to 230° Fahr. On analysis of the second fraction with oxide of copper and oxygen gas, the following numbers were obtained:—

Carbon	88·11
Hydrogen	9·18
Oxygen	2·71
	100·00

If the loss taken as oxygen be added to the carbon, we should have—Carbon, 90·82; hydrogen, 9·18; numbers which nearly approximate to those which are required for toluene ($C_7 H_8$), which require—Carbon, 91·30, and hydrogen, 8·70; and it is to be remarked that toluene boils, according to Warren, at 110 3° C. = 230·9° Fahr., which is very nearly the boiling point of the fraction analyzed.

When the sludge hydrocarbons are cohobated with sodium, a large quantity of a salt is formed. The hydrocarbons were, therefore, distilled away, and water was added to the sodium compound. An oil separated, and the soda solution was found, on examination, to contain a fatty acid.

When the oil separated by water from the sodium compound was rectified, a considerable portion distilled at a moderate temperature. It appeared to be naphtha, and probably corresponded to the altered toluene first analyzed; but the thermometer suddenly rose to 200° C. = 392° Fahr., thus indicating the presence in the sludge of a different class of compounds to the homologues of benzene.

The whole distilled between 220° and 270° C. = 428° to 518° Fahr. Its specific gravity at 16° C. = 60·8° Fahr. was 0·900. The fractions were mixed together, digested for 24 hours over sodium, and again rectified in a small tube retort, as the quantity was very small. The first half was rejected, and the second was analyzed; it yielded—

Carbon	86·31
Hydrogen	10·61
Oxygen	3·08
	100·00

If, as before, we add the loss taken as oxygen to the carbon, we have —Carbon, 89·39; hydrogen, 10·61; numbers which are not far from those required by xylene ($C_8 H_{10}$); but, as xylene boils at about 139° C. = 282·2° Fahr., we should have to assume the oil to have the composition of a substance polymeric with that hydrocarbon.

The above examination of the hydrocarbons in sludge is, as has been said, a mere outline, but it is, as far as the writer knows, the only attempt yet made to attack the subject. It would be interesting to ascertain whether the loss taken as oxygen was not, to some extent, due to the presence of a sulphur compound. It is to be hoped that chemists who have the opportunity will carry out the line of research here indicated, as it is sure to yield results of interest to science, and of importance to the practical tar distiller.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

DISCOUNTS ON GAS ACCOUNTS.

Sir,—The letter of "A Country Secretary," in the Journal of the 13th inst., raises a difficulty in the way of the system of allowing discount on gas accounts, which, of course, applies in the case of those companies which, under their Special Acts, are affected by the "sliding scale" for maximum dividends. Perhaps companies seeking such powers in future might succeed in getting "the net price for prompt payment" allowed as the standard price.

Leaving the few companies at present so situated to clear up the difficulty as they can, or submit to it as they must, there is, of course, a large majority of companies, with and without Special Acts, as well as municipal gas undertakings, in which this difficulty does not arise. In all such undertakings the adoption of the system of allowing to all consumers discount for prompt payment will be found to work most advantageously. I see that some companies are proposing to gain somewhat similar ends by obtaining power to charge interest; but this system is objectionable, and often offensive to the consumer. I have now had good experience of both systems. The discount system was commenced in 1865 by the Sheppy Gas Company, and was continued successfully until 1870. We then allowed 6d. discount off a maximum price of 5s. per 1000 feet. But circumstances beyond control at that time necessitated the adoption of 4s. 6d. maximum price. We then introduced the system of charging monthly interest at the rate of 10 per cent. per annum on all accounts not paid by the end of the first month of the ensuing quarter. Great dissatisfaction often arose at this charge, and the system never worked smoothly, although we gave it seven years trial. We were often so placed as to be glad to accept payment without interest, rather than give an excuse for further delay in payment.

In the middle of 1878, being in a position to offer a reduction of 3d. from the 4s. 6d. per 1000 feet then charged, the Directors decided to do this by re-introducing the discount system. The gas accounts are made out as early as possible after the end of the current quarters—*i.e.*, the first days of January, April, July, and October. They are then delivered to the consumers a clear week or ten days before the end of those months. Many pay when the account is delivered, but the majority pay afterwards at the office, which they are requested to do at the head of the account. If paid on or before the last day of the month, the discount, which is marked at the foot of each statement, is allowed, but not otherwise; and we find it necessary to apply this hard-and-fast rule with great strictness. The result is that, under the discount system, we receive about 85 per cent. of the rental by the end of the month, while under the interest system we rarely received more than 40 per cent. by that date. We shall make a further reduction after the 30th of June next, and shall then allow 6d. discount off the full rate of 4s. 6d. per 1000 feet.

One great advantage of the system is that it shortens the credit taken by risky customers, and does away with the tendancy to fall into arrears. Upon a rental of about £7000 per annum, my balance of arrears of overdue accounts, carried forward at the end of each quarter, seldom exceeds £140; and, I believe, where the system of allowing discount for prompt payment is fairly tried, it will be found popular with the consumer, and in every way advantageous to the interest of the company. Of course, giving discount to large consumers taking a stipulated quantity of gas is an entirely distinct principle from the form I have dealt with.

Sheppy Gas Company, May 17, 1879. A. W. Marks, Secretary.

THE REGISTRATION OF GAS-METERS.

Sir,—Referring to the correspondence in your impression of the 13th inst. on this subject, should not "Lex" have been "Legifer"? At all events, he can scarcely claim relationship with the *lex* of time immemorial: "*Lex est ratio summa insista in natura!*"

I have yet to learn, independently of the assertion of your correspondent, that any vendor can legally charge a customer with any article not served, simply because he is a customer by Act of Parliament. If an account for the article has been incorrectly rendered, and an adjustment be made, that adjustment must be precise and accurate. If for the £5 worth of goods an erroneous charge has been made of £5 3s., the correction must be made to the absolute claim, and not to £5 2s., robbing the consumer of 2s. by the "act" of "Lex."

The margin in a meter of 2 per cent. fast and 3 per cent. slow is convenient as a test of comparative accuracy, and if the meter register within these limits, a legalized accuracy is established, and no adjustment takes place. But immediately the meter transgresses either of these limits, it loses the protection of the Act of Parliament; and, as a consequence, the adjustment must be made with precision, whether in favour of, or in opposition to the vendor.

That any modification of the claim made should be limited to the quarter in which the complaint is made is natural, and demands no comment.

The extravagant deduction of "R. K. M." is strictly within the bounds of a *reductio absurda*.

May 17, 1879. "Lux."

THE ANALYSIS OF GAS COALS.

Sir,—In the Journal of the 20th inst. a report is given of the meeting of the West of Scotland Gas Managers Association, at which Mr. Andrew Scott, of Falkirk, brings a serious charge against several gentlemen for furnishing false analyses of coal.

The analysts named are Messrs. G. R. Hislop, Macadam, and Wallace, gentlemen whose long and extensive experience have secured for them a well-deserved eminence in that branch of physical science, and whose accuracy is unquestionable. Mr. Scott having failed to produce the results expressed in the respective analyses, arrives at the summary conclusion they are wrong; and what is more surprising, his views appear to be generally supported by the members present. It does not seem to have occurred to Mr. Scott that there might be differences in the conditions under which the respective distillations were made, which might probably have afforded him the means of reconciling the differences before arriving at the hasty conclusion that the analyses were wrong.

In the examination of a coal, the object aimed at is to arrive at its *absolute value*, and should Mr. Scott or any one else fail to realize similar results, he must not charge it either against the coal or its analysis. On the contrary, he will find that the difference, whatever that may prove to be, is simply the *measure of the imperfections incident to his working*. Whether these imperfections may arise through difference in temperature, leakage from retorts, condensation through the agency of dips in the hydraulic main, or from any other cause, is matter for his own consideration; but he ought to know that it is not until similar conditions obtain in the distillation of the coal that similar results will follow, and I cannot but think it presumption on his part to call in question the integrity of gentlemen whose accuracy and honour are above suspicion.

James Paterson, C.E., F.G.S., &c.

Gas-Works, Warrington, May 21, 1879.

GAS AS FUEL.

Sir,—I must ask your indulgence for a few words of personal explanation, in answer to the remarks of Dr. Bond in your last week's issue, respecting one of my articles on "Gas as Fuel."

I am naturally reluctant to correct such a courteous critic as the learned Doctor, but having carefully looked through his letter for instances in proof of his assertion that my article of April 22nd is lacking in clearness, I am constrained to say that the sins I am therein charged with are clearly of omission only, for what I did state was expressed with sufficient clearness to be appreciated by the Doctor himself, and, therefore, presumably by your other readers. I did not pretend to state all the grounds of objection to heating rooms by stoves, nor to specify all the collateral advantages of open fires, but only just so far as I considered necessary to explain my case, which was also my reason for drawing an illustration from the action of the sun on the earth. I do not say that the additional observations of Dr. Bond on these points are not perfectly true, but so were my own; and it cannot be denied that no explanation of the phenomena in question would be correct without taking account of the considerations expressed in my article, however much the case might be strengthened by citing additional reasons.

Thus far in justification of my general theoretic statements. With respect to my remarks on gas-flames, Dr. Bond appears to be well satisfied with their clearness and truth, for he has certainly grasped the leading intention of the article. I may state that I have never seen an Euthermic stove, and cannot, therefore, express an opinion as to how far the Doctor may have succeeded in putting his undeniably sound theories into practical shape.

Isca.

A QUERY.

Sir,—In reference to the inquiry of "B. A. T.," the safest plan for the gentleman to adopt will be to have a very small light gasholder at his house, fill it from the day pressure, and stop it in for night consumption by a valve. If necessary, the night and day pressure of the small holder might be regulated by weights.

Kingsbridge, May 22, 1879. W. Jarvis.

Priors Marston Water Company.—This Company was registered on the 12th inst., without articles. It is formed with a capital of £500, in £2 shares, for the purpose of supplying the parish and neighbourhood of Priors Marston, Warwick, with water.

The Water Supply of Colne.—On Monday, the 19th inst., a meeting of ratepayers was held in the Cloth Hall, Colne, for the purpose of taking into consideration "the present inadequate supply of water in the district, for domestic and sanitary purposes, and the measures to be adopted in consequence thereof." The chair was occupied by Mr. T. T. England, Chairman of the Colne and Nelson Local Board, who, in opening the proceedings, explained that the meeting had been called in compliance with a numerously signed memorial, in which the attention of the Board was called to the present inadequate water supply, and requesting them to convene a meeting of ratepayers to take the matter into consideration. Great complaints had been made from time to time of the insufficiency of the water, as well as of its impure quality, and the Local Board had, soon after their formation, been in negotiation with the Water Company, with the view of taking over their undertaking, in the hope that, by so doing, some improvement might be effected. The negotiations had, however, all fallen through. After some conversation, Mr. Rushworth moved—"That the Colne and Marsden Local Board take immediate steps to supply Colne with water in what way they may think best." This was carried *nem. dis.*

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, MAY 19.

The Examiners reported that the further Standing Orders applicable to the Southend Water Bill have been complied with, and that no further Standing Orders are applicable to the Arlecdon and Frizington Water Bill.

Birmingham Corporation Water Bill,—read the third time, and passed.

TUESDAY, MAY 20.

The Examiners reported that no further Standing Orders are applicable to the Nelson Local Board Bill.

The Aire and Calder Navigation, Imperial Continental Gas Association, Warrington Corporation, Belfast Water, and Ilkley Gas Bills were brought from the Commons, read the first time, and referred to the Examiners.

The Rawmarsh Local Board, and the Bromley Gas Bills were read the third time, with the amendments, and passed.

FRIDAY, MAY 23.

The following Bills received the Royal Assent by Commission:—Birmingham Corporation Water, Brighton and Hove Gas, Bury St. Edmund's Gas, Glasgow Corporation Water, Grand Junction Water, Llandudno Improvement, Manchester Corporation Water, New River Company, Nottingham Water, Pemberton Local Board, Portsmouth Water, Sleaford Water, Tipton Local Board, Westgate and Birchington Water.

The Examiners reported that the further Standing Orders applicable to the Houghton-le-Spring District Gas Bill have been complied with.

Southend Water Bill,—read a second time, and committed.

Glossop Gas Bill,—read the third time, with the amendments, and passed.

The Colchester Water, Crystal Palace District Gas, Mirfield Gas, and Nottingham Corporation Bills were brought from the Commons, read the first time, and referred to the Examiners.

THE METROPOLITAN FIRE BRIGADE AND THE WATER SUPPLY.

Earl GRANVILLE, pursuant to notice that he would "call attention to the report of the Select Committee of the House of Commons, in 1877, on the Metropolitan Fire Brigade, and move for papers," said that the fire which recently occurred at his own house had drawn his attention to the system prevalent in the Metropolis for the protection of life and property from fire. After referring to the numerical strength of the Fire Brigades, in proportion to the population, in London, Paris, and New York, and to the American system of dealing with fires, he stated that in London there was no unity of management. Of those who took part officially in dealing with a fire there were the police, who were almost always first on the spot. In many provincial towns they at once applied a hose to a hydrant of which they had the key, and thus constantly themselves put out the fire in the room in which it originated. In London they had no power to extinguish the fire. Their business was only to arouse the inmates of the place on fire, summon help, and keep order. The Fire Brigade—a body entirely separate, under the orders of the Metropolitan Board of Works—when they arrived, were frequently helpless until the turncock came. He was the private servant of one of eight Water Companies, who were governed by their own special Acts, with independent areas, separate systems of pipes, and regulations. They were under no obligation to supply sufficient water for the extinction of fires, though they were bound to give gratuitously what happened to be there. There was no connection between their water services, no means of sustaining pressure or of concentrating the whole power of the water service of the Metropolis upon one spot. The Salvage Corps was another separate body under the orders of the Insurance Companies. It might be said that this arrangement sounded anomalous, but it worked well. It was most creditable to the energy and zeal of those concerned that it worked at all. But the system itself was bad, and did not work well when compared with those places where unity prevailed. In the evidence taken by the Committees of 1876 and 1877, by the Committee of Inquiry of the Society of Arts, and by the Committee of the Corporation of London which visited Manchester, it was shown that there were in proportion three times more loss of life and property in London than in those towns where unity prevailed. This saving of life and property in the provincial towns was partly owing to concentration of management, and partly to the constant supply of water, and the fact that hydrants were placed on all the mains, and in the houses themselves. As to an amalgamated system of water supply, which would enable a non-intermittent flow of water to be furnished to the whole area of the Metropolis, its advantages for the protection of life and property against fire and in favour of public health, were self-evident; and when it had been proved to the satisfaction of the Committee of 1876-7, and, indeed, of all the other committees and commissions, that this could be done with diminished expenditure, with less waste of water, and with a cutting off of the most unwholesome sources of supply, it seemed incredible that there should be delay in carrying out such urgent work. He could not deny that the economy of money and of water and the possibility of a constant supply of water had been questioned. The last conclusion of the Committee of 1876-7 was that effect should be given by the Legislature to the recommendations of the Committee, a conclusion proposed by Sir H. Selwin-Ibbetson, not in his individual capacity, but as representative of the Home Office; and it was unanimously adopted by the Committee. When, therefore, he (Earl Granville) gave notice of his motion, he had every reason to hope for a favourable reply from Her Majesty's Government; but a deputation from the London Vestries had since waited upon the Home Secretary (Mr. Cross) to represent the great and increasing grievance to the ratepayers of the Metropolis under the present system, and to urge the consolidation of the eight Companies with a view to an economy of money and an adequate supply of good water. Mr. Cross was reported to have announced that, with regard to dealing with such legal powers as the Companies possessed, Parliament never interfered excepting to carry out any arrangement that might have been made, and apparently left the responsibility to the Vestries of making such an arrangement. This gave him some anxiety as to the answer of the noble earl (Earl Beauchamp) who represented the Department. It was impossible that he could, on behalf of the Home Office, impugn on their merits the value of the recommendations of the Committee, which in the circumstances he (Earl Granville) had stated must be considered as the opinion of the office on the abstract merits of the question. But if the noble earl urged delay, he could only say there was every possible objection to it. If, as was the opinion of the Committee, the London system entailed a three times greater sacrifice of life and property than those systems where unity prevailed, the necessity for immediate action was overwhelming. Besides, every year's delay added enormously to the pecuniary difficulty of an arrangement with the vested interests of the Companies. Every year would add something like £1,750,000 to the sum which had to be paid. It was out of the question that the Vestries, who had nothing to do with the police, who had no special knowledge on the matter, or skilled officers to advise them, should have the task of settling the terms and mode of purchasing the means of supplying water to the Metropolis. The President of the Council and his Commission reported "that such technical details could only be carried out by competent professional skill, and that this must be carefully determined under the guidance of the experience gained in the process of the change." The Metropolitan Board failed to treat with the Water Companies, who declined to negotiate with them, and they had twice been discouraged by the Government from doing so. The privileges and powers of the Companies had been confirmed under the sanction of the Government. They were exercised under the supervision of Government departments and Government officers, of a Government auditor, and a Government surveyor formerly under the Board of Trade, now under the Local Government Board. It was the practice of the Government to give its assistance in this matter. To take one instance, there was the Commission for the consolidation of the roads of upwards of 100 parishes, under a Royal Commission or Road Trust, which worked remarkably well. He doubted whether there would be any insuperable difficulties in coming to a speedy arrangement with the Water Companies. Compulsory powers to deal with vested interests on behalf of life, property, and the public health of the Metropolis were clearly as justifiable as those for improving the railway communications of the country. In both cases there must be no confiscation. There must, on the contrary, be liberal compensation. The difficulty of coming to an agreement ought to be much diminished—first, by the fact that the Shareholders did not now profit at all in proportion to the increasing rates to which the consumers of water were subject; and, secondly, that Parliament had in numerous instances settled the principles on which such compensation should be given—viz., 25 years purchase of the highest net dividend, with an allowance for compulsory purchase, and also, on arbitration, an allowance for prospective advantages. Not many years ago the noble earl at the head of the Government publicly begged the civil engineers to direct their attention to the improvement of the public health, and he suggested as a subject most worthy of their consideration the supply of water to London. He was told that he also encouraged Colonel Beresford to propose a Bill for the purpose, even before the Select Committee had sat, and he knew that it was a proud boast of his, at the commencement of his administration, that the public health would be the principal care of his Government. He did not think there could be a better way of redeeming such a pledge than by carrying out the recommendations of the Committee, which dealt with a matter of great urgency as regarded life, property, and public health.

Earl BEAUCHAMP said there was no doubt, as had been said, that the Prime Minister had always taken a great interest in questions relating to the public health, and he was duly impressed with the importance of the question now before the House. It was impossible, however, to promise immediate redress of the grievances which had been set forth. The Committee referred to received a body of most important evidence, and made a report containing a number of very valuable recommendations—valuable when regarded from an abstract point of view, but not easy of accomplishment when the matters of detail came to be considered. The proposal to amalgamate the Water Companies involved a very large question, and might, if carried into effect as proposed by the Committee, involve an expenditure which would be out of proportion to the advantage either actually gained or possible to be gained. It had been calculated that £20,000,000 would be required to buy up the rights of the Companies, and though without doubt a scheme could be easily drawn up which would meet the wishes of the Companies, he much doubted whether it would be as easy to satisfy the ratepayers. A subject such as that before the House would not pass through the Commons without severe and searching examination. He did not say that the Government were not prepared to deal with the question, and when the time for dealing with it should come, the report of the Committee would form the basis of legislation. The question was one of a very great and important character, and one which it would be very rash for the Government to take up unless they were certain of settling it in a satisfactory and speedy manner.

Lord ABERDARE said he regretted very much that the noble earl who had just spoken had not held out some hope of a speedy termination to the state of affairs of which the noble earl, in opening the debate, complained. Royal Commissions and Committees of both Houses had more than once insisted that, in order to ensure the rapid extinction of fires and a constant supply of pure water to the Metropolis, the Water Companies should be amalgamated. The Royal Commission of 1869 laid it down in the clearest way that the control of the water supply of London should be entrusted to a responsible public body. The expediency of uniting the Water Companies under one controlling head was amply demonstrated in the report of that Commission, various reasons being given for the adoption of the course which was advocated. That course, the Commission stated, could alone effectually ensure to the Metropolis a constant supply of water for domestic purposes as well as for the extinction of fires. Again, by its adoption the poor would be provided with proper water. An attempt, he might remind the House, had been made by the late Government to secure this advantage for the poorer classes, and considerable pressure had been brought to bear upon the Companies by the Act of 1871, which, he was glad to say, had resulted in some improvement. The advantage of a constant water supply was, however, by no means universally enjoyed by the poor. Some of the Companies had exerted themselves; but there remained one which had done nothing at all, and two which had done very little. The Commission to which he had referred also enumerated among the advantages of the system which they proposed for adoption that it would result in uniformity of management and in improvement in the quality of the water supplied. It would, he thought, be allowed that the places in which a fire would be most likely to spread were just those where it would be most difficult to procure an adequate supply of water under the existing system. They had it on high authority that they could not make satisfactory arrangements for the extinction of fire if they had not a constant water supply at their command. He regretted, however, to say that the Government had taken no step towards giving effect to the recommendations contained in the report. The Metropolis and its suburbs contained a population exceeding that of Scotland, and yet they were behind one of the chief cities of Scotland as regarded the means of extinguishing fire.

Lord DENMAN had no doubt that the Government would deal with this important question, but they could not be expected to do so, in the present state of public business, during the present session.

The Earl of SHAFTESBURY said that the question then under consideration had been before the House for the last 30 years, and it was quite time that it was settled. The present water supply of the Metropolis was perfectly shameful. There were some districts of London in which if a fire broke out it would be like the Great Fire of London in the extent of its devastation. He spoke feelingly on this subject, having more than 30 years ago been Chairman of the Board of Health, which proposed a scheme for the remedying of the evil. That it was an efficient remedy was proved by the fact that the Water Companies rose as one man against it. One of the results was that the Board was dissolved with a certain amount of contempt, and ceased to exist. The evil, however, went on. Government after Government had had the question before them, but nothing had been done. During the course of his investigations in the east of

London at the period to which he referred, he found men drinking the most detestable beer, and he asked them why they did so, and they replied to the effect that the beer was bad, but the water was worse. He could not too earnestly press upon Her Majesty's Government the necessity of dealing, and that promptly, with a matter which seriously affected the morals, the health, and the happiness of many thousands of their fellow-subjects.

Earl FORTESCUE desired also to press upon Her Majesty's Government the urgent importance of taking the question into their consideration. In the year 1852 the property of the Water Companies was valued at something like £8,000,000 sterling; now, however, the valuation was £26,000,000. Some of those Companies were extending their works to supply an increased population, and did so very willingly. "Coming events cast their shadows before," and the Water Companies knew that at no distant day that which was being done by great city after great city, and even by small town after small town—namely, the supply by the local authority to them of water and gas—would be done in this great Metropolis. Delay would only make the terms more onerous. The economies, however, of consolidation and the suppression of secretaries, solicitors, and other functionaries of the Companies would be sufficient to pay the interest on the cost of securing an efficient and constant supply of water at high pressure. In Manchester, when an alarm of fire was given, the mains being charged with water at high pressure, the police had nothing to do but to attach hose to a stand-pipe and turn a stream of water on the fire. He ventured to hope that the Government would seriously entertain this question, being assured that there was a large margin for economy and efficiency. London might have water less cold in winter and less warm in summer through being carried farther underground out of the reach of the frost and of the sun; and, with these agreeable and convenient changes, there would be greater security to life and property than at present.

The Duke of RICHMOND and GORDON said one would think there was nothing in the world easier than to deal with this question. There had been a Royal Commission, of which he was Chairman, to inquire into two schemes to bring water from Wales and Cumberland respectively. It sat a considerable time, took much evidence, and arrived at conclusions to which he still adhered. The matter was one of great difficulty, and great care would have to be exercised in coming to anything like a practical conclusion to effect a great change. It was said that, for the sake of the morals, health, cleanliness, and decency of the people, the Government ought at once to bring in a measure, but no information was given as to how the Government were to meet the difficulties with which this question was beset. If the undertakings of the Water Companies were to be purchased, he would ask how? Somebody having the confidence of the ratepayers must be empowered to purchase them. The noble lord who had been Home Secretary talked about the facility with which something might be done; but, although he held office after the report of the Commissioners referred to was made, he attempted to deal with the question only in a small way, and shrank from taking any large step such as entrusting some public body with the water supply of the Metropolis.

Lord ABERDARE said he introduced a Bill, but there was no power to carry it the same session.

The Duke of RICHMOND and GORDON said the Bill proposed to put the matter in the hands of the Metropolitan Board of Works, and that being found impracticable, Lord Aberdare did not attempt to deal with the questions subsequently. In London there were the City and also the Metropolitan Police. Were they to be united for the extinction of fires? One reason which induced him to dissent from the engineering schemes mentioned was that he did not think it advisable that London should depend for water upon one source, and one source only. The matter was engaging the constant attention of the Home Secretary, who, if he saw his way to introduce a satisfactory Bill, would not shrink from doing so, as was evident from what he had done with regard to artisans dwellings, and other matters of that kind. The right honourable gentleman had realized the fact that the difficulties were enormous, but the subject still occupied his attention.

The Earl of CAMPERDOWN said the inhabitants of the Metropolis would derive but small consolation from what had been said on behalf of the Government, and more water had been poured down the back of the noble earl than he could get at his house when he wanted it. He admitted that the question was not an easy one to deal with, but Governments had solved greater difficulties than the purchase of the undertakings of a few water companies. It was quite as difficult to acquire the telegraph companies; but that was successfully achieved. Every one would admit that this was not a party question, and that the common object was to get as good, efficient, and cheap water supply as possible for the Metropolis. Of course, it would be necessary to have a central authority which would command the confidence of the ratepayers, and surely the Home Secretary was quite competent to create such an authority. Whatever Board of Management might be elected, it would certainly not possess the confidence of the ratepayers in a less degree than did the present Water Companies. The property of the Companies could, of course, only be acquired by means of a compulsory Act. Any voluntary arrangement that might be proposed by the District Boards of the Metropolis would have no effect but to enhance the value of the Companies shares. There were many reasons why the water supply of the Metropolis should be in the hands of a single body, but it would probably suffice to mention two. These were, first, that the present supply of water was inadequate, and that it would be necessary to supplement it at no distant time—a duty which they would surely never entrust to the present Companies; and, second, that the Companies seemed to have the power of doubling or trebling their rates without conferring any corresponding benefit upon the ratepayers. Four or five years ago, when the present Metropolitan Valuations Act was coming into force, he foresaw that the Companies might raise their charges in consequence of it, but the noble duke said it was not the intention of the Government to confer upon them any additional rating powers. Nevertheless, legally or illegally, the Companies did raise their charges on that occasion all over the Metropolis, without the slightest benefit resulting to the consumers, and he had received hundreds of letters asking him to do his best to prevent the recurrence of such an anomaly, which Parliament could never have intended to allow. As the present motion could lead to nothing, he reserved to himself the right of proposing a resolution on this subject on some future day.

The motion was then agreed to.

HOUSE OF COMMONS.

MONDAY, MAY 19.

Manchester Corporation Water Bill, Tipton Local Board Bill.—Lords amendments agreed to.

Bills read the third time, and passed:—Aire and Calder Navigation, Imperial Continental Gas Association, Warrington Corporation.

Colchester Water, Crystal Palace District Gas, Mirfield Gas, and Nottingham Corporation Bills, as amended, considered; to be read the third time.

Queenstown Gas Bill.—Petition for additional provision referred to the Examiners.

Lighting by Electricity.—Petitions against, were presented from the following Gas Companies:—Altrincham, Bath, Chester United, Devonport, Fareham, Folkestone, Newcastle-under-Lyme, Peterborough, West Ham.

Requisitions to withdraw their petitions against the following Bills were presented:—Blackpool Extension and Improvement, from (1) Richard Handley, (2) The Postmaster-General; Leicester Corporation, and Newcastle-upon-Tyne and Gateshead Gas, from the Postmaster-General; South Shields Gas, from (1) North-Eastern Railway Company, (2) The Postmaster-General.

The *locus standi* of the Vestry of Thirsk, as petitioners against the Gas and Water Orders Confirmation Bill (Thirsk District Water Order) was disallowed.

ALLIANCE AND DUBLIN CONSUMERS GAS BILL.

Mr. PERCY WYNDHAM reported from the Select Committee—"That in the case of the Alliance and Dublin Consumers Gas Bill, they had examined the allegations contained in the preamble of the Bill, and amended the same by striking out the recitals relating to the construction of sheds on Sir John Rogerson's Quay, and found the same as amended to be true, and had gone through the Bill, and made amendments thereunto."

TUESDAY, MAY 20.

Brighton and Hove Gas Bill, Glasgow Corporation Water Bill,—Lords amendments agreed to.

Bills read the third time, and passed:—Belfast Water, Ilkley Gas, Rotherham Borough.

Bill reported:—Stourbridge Gas.

The Dun Drainage Bill (Lords) was reported, without amendment; to be read the third time.

The West Kent Main Sewerage Bill (Lords) was reported, with amendments.

Blackburn Improvement Bill, Over Darwen Corporation Bill,—as amended, considered; to be read the third time.

Weardale and Shildon District Water Bill,—as amended, considered; amendments made; Bill to be read the third time.

Queenstown Gas Bill.—The Examiners report—"That the Standing Orders have not been complied with in the case of the petition for additional provision in the Queenstown Gas Bill," was referred to the Select Committee on Standing Orders.

Lancaster Gas Bill.—The following resolution, reported from the Select Committee on Standing Orders:—"That in the case of the Lancaster Gas Bill, petition for additional provision, the Standing Orders ought to be dispensed with; that the parties be permitted to introduce their additional provision," was agreed to.

Lighting by Electricity.—Petitions against, were presented from the Dartford Gas and Londonderry Gaslight Companies.

Requisitions to withdraw their petitions against the following Bills were presented:—Gas and Water Provisional Orders Confirmation (Wellingborough Gas Order), from London and North-Western Railway Company; Knutsford Light and Water (additional provision), from Henry Rose, for himself and the Rev. Edward Penrose Hathaway and John Pennington Legh.

WEDNESDAY, MAY 21.

Morecambe Gas, Preston Gas, Stratford-upon-Avon Corporation and Local Board of Health, and Wisbech Gas Bills,—as amended, considered; to be read the third time.

THURSDAY, MAY 22.

Bills read the third time, and passed:—Colchester Water, Crystal Palace District Gas, Mirfield Gas, Nottingham Corporation.

Cardiff Corporation Bill,—as amended, considered; amendments made; Bill to be read the third time.

Wombwell Local Board Bill,—as amended, considered; clause added; amendment made; Bill to be read the third time.

FRIDAY, MAY 23.

Bromley Gas Bill.—Lords amendments agreed to.

Bills read the third time, and passed:—Blackburn Improvement, Over Darwen Corporation, Weardale and Shildon District Water.

Plymouth and Stonehouse Gas Bill,—as amended, considered; amendments made; Bill to be read the third time.

The Gas and Water Provisional Orders Confirmation Bill (Thirsk District Water Order) was reported (Provisional Order confirmed).

Bills reported:—Blackpool Extension and Improvement, Knutsford Light and Water, Leicester Corporation, Newcastle-upon-Tyne and Gateshead Gas, South Shields Gas.

The Colwyn Bay Water Bill (Lords) was reported, with amendments.

Lighting by Electricity.—Petitions against, were presented from the following Gas Companies:—Bristol United, Exeter, Swansea, and Worcester New.

HOUSE OF LORDS COMMITTEE.

THURSDAY, MAY 8.

(*Before Earl* MORLEY, *Chairman; Earl* MANVERS, *Lord* CLIFTON, *Lord* LOVEL AND HOLLAND, *and Lord* ROMILLY.)

BRIGHTON AND HOVE GAS BILL.

Mr. RICHARDS, Q.C., Mr. MICHAEL, Q.C., and Mr. SHIRESS WILL appeared for the promoters; Sir E. BECKETT, Q.C., Mr. LITTLER, Q.C., and Mr. STEPHENS for the Corporation of Brighton; and Mr. GRANVILLE SOMERSET for the Hove Commissioners, petitioners against the Bill.

Mr. RICHARDS, in opening the case on behalf of the promoters, said that the town of Brighton had been for many years supplied with gas by two Companies, one of which—the Old Company—was under little or no parliamentary restriction, while the Brighton and Hove Company were under very stringent parliamentary provisions; nevertheless, there had been a wholesome competition between the two Companies, which had answered extremely well for the inhabitants. A line of division had, however, been agreed upon between the two Companies, and the district affected by the present Bill was the western portion of Brighton, the parish of Hove, and other places mentioned in the preamble. In the year 1866, the Brighton and Hove Company made an application to Parliament, which was subject to a strong opposition—in the first place from a rival Company, which, although they obtained parliamentary powers, never exercised them; and also by the Corporation of Brighton. The Company, however, obtained their Act, notwithstanding the terms were somewhat stringent. They were restrained from manufacturing any residual products at Hove, where the works were then situated, as the place was becoming thickly populated. They were also prevented from erecting further works on the land they then occupied, and, if they required more land, they were to go between Shoreham and the sea. The Act of 1866 also contained a most objectionable clause relative to the price of gas, which was fixed at a price quite unprecedented—seeing they were a country Company—viz., 3s. 6d., and at that price they had laboured on since that time, with very indifferent dividends. Of late years, by care and economy, they had

been more successful, and that price still remained in the Bill but the business of the Company could not be carried on if it were further reduced. Before the Committee of the House of Commons, not one single question had been asked with reference to the price, and, therefore, it could not be supposed there was any material point with regard to it. The capital applied for by the present Bill was originally £250,000, but the House of Commons had cut it down to £150,000, the borrowing powers being reduced in proportion. The auction clauses were, however, introduced into the Bill, so that the amount of capital was immaterial. The preamble of the Bill was practically uncontested, the only question raised being with reference to the amount of capital, the Corporation saying that £150,000 was too much; but the House of Commons having allowed that amount, he (Mr. Richards) hoped their lordships would not further reduce it. The only effect of having too small an amount would be that the Company would have to apply to Parliament again at an earlier period than ten years, which was about the time the proposed capital would carry them on for. With regard to the petitions, there was one by Mrs. Smith; but as she was a married woman, she had no right to be heard, as it was shown that her husband was in existence. The Corporation of Brighton, in their petition, stated that "the amount which the Company are seeking power to raise is largely in excess of their present requirements, and of any expenditure which can be reasonably necessary for many years to come; and the Company now have unexercised powers of raising money, sufficient, or nearly sufficient, for all their legitimate purposes, present or prospective." It was not easy to see why the Corporation should care about the matter; on the other hand, they were, of all people in the world, most interested in having, not only ample means in point of money, but ample means in every respect, in order to perform the duty of lighting the streets. Then the petition stated: "The various purposes for which the Company are seeking powers to raise additional capital under the Bill will, to a great extent, be unremunerative." What ground could there be to make such an allegation as that against a commercial Company, who would certainly not raise the capital if it was likely to prove unremunerative? The condition of the Company depended upon their being able to perform the duty of lighting the place, and they would soon cease to be in a flourishing condition unless they had capital to meet the necessary extensions. Another allegation in the petition was to the effect that if the Company obtained power to purchase additional land within the burgh, they would be enabled to erect gasholders and other works, and in so doing create a nuisance; but there was not the slightest intention to do that, and any provision necessary to prevent it the Company would be very ready to submit to. On the other hand, it could not be denied that they wanted offices in Brighton, which were essential to carrying on the business; but the objection could hardly point to that. The petition, as the Committee must have seen, was not directed against the preamble, but only against the clauses. The petition of the Hove Commissioners was very much to the same effect, but they had been offered a clause preventing the Company from acquiring "in any manner, or for any purpose, any land in the parish of Hove in addition to that they shall be possessed of, or entitled to, upon the 1st of January, 1866." The Commissioners of Hove also complained of great and permanent injury by the Company having erected large gasholders almost immediately adjoining the parish church, which had greatly depreciated the value of the adjacent property; but that was about as ungracious a statement as ever appeared in a petition. The town had spread westerly, and probably there were no finer houses than those in Adelaide Crescent, but they had all gone to the gas-works. The Commissioners also complained that they were not allowed to have a special auditor, the same as Brighton; and they also wished to have the custody of a map of the mains and the deposit of a standard burner. He (Mr. Richards) would have thought it sufficient for the Hove Commissioners to receive a copy of the audit; and with regard to the map of mains, why were they not able to step into the Town Hall of Brighton? The same remark would apply to the model burner. The petitioners also contended that there were other provisions in the Brighton and Hove Act of 1866, with regard to the public lamps, which bore harshly and injuriously upon them, and which ought to be altered or repealed, but what those provisions were he did not know, because as soon as the preamble was passed the Commissioners of Hove walked off in a pet, whereas if they had remained the matter might have been arranged by clauses. The petitioners further complained that the Bill did not in any form or mode incorporate the Gas-Works Clauses Act of 1871, which they submitted should be done; but it might be observed that the Corporation of Brighton did not raise any difficulty of that sort. They seemed perfectly content with the very satisfactory and full form of accounts which were at present supplied to them, and with the audit which took place at present. The Company, however, now proposed to incorporate the Act of 1871, in consequence of an intimation to that effect from Lord Redesdale, although he supposed Sir E. Beckett would blame him for so doing. They could not, however, oblige both parties. One said, "Put in the clauses of the Act of 1871;" the other said, "Leave them out." The Company had dealt with it as even-handedly as they could, but they found themselves subject to the authority of the Chairman of Committees, and, in obedience to him, that Act was incorporated.

Mrs. Smith appeared in support of her petition, and stated that her husband was too ill to attend to business, and that he had given her the property on his death.

The Chairman said that in the opinion of the Committee Mrs. Smith had no *locus standi*.

The following evidence was then called:—

Mr. *J. B. Paddon*, examined by Mr. Richards.

I have been Engineer and Manager to the Brighton and Hove Gas Company for nineteen years. Up to the year 1871 the works were carried on at Hove, but in that year we removed the manufacture to Portslade, and the property at Hove was used for the purpose of storeage only. The removal left a portion of ground unoccupied, upon which additional gasholders were erected, which has been very convenient to us. For many years after the works were established they stood alone, or nearly so.

Examination continued by Mr. Michael: There is no doubt that the removal of our works was a great advantage to Hove, the land having acquired a much higher value than it had before. The illuminating power of our gas under the Act of 1873 was 14 candles, tested by a No. 1 Argand burner —the same as that used by the Metropolitan Gas Referees. It is tested at the Town Hall at Brighton, which is about four miles from the place of manufacture. That is one of the hardest tests to which gas can be exposed. From the passing of the Act of 1873 to the present time the gas has always been superior to the prescribed standard. The Company test their gas frequently eight or ten times a day, and those tests corroborate and support the results of the official analyst, who tests the gas without our knowledge at all. Previously to 1873 we were charging 3s. 6d. per 1000 feet both in Hove and at Brighton; but in that year we found we were supplying at less than cost price, and we applied to Parliament and obtained power to charge an additional 6d. per 1000, and also to test the gas by the burner generally used throughout the kingdom, the burner prescribed by the Act of 1866 being entirely obsolete. During the coal famine all companies who were charging anything like their maximum price were obliged to obtain relief in the same manner we did. At present the outlying districts are charged increased rates in proportion to their distance from the source of supply. With long mains and small quantities of gas, the supply must cost more than with short mains and large quantities. By the Act of 1866—and confirmed again by the Act of 1873—the Corporation of Brighton are entitled to obtain a supply of 15-candle gas upon condition of paying 3d. per 1000 feet more; and there was also a revision clause, by which, if we required relief under similar circumstances, we could make an application to the Board of Trade. That clause also enabled the local authorities to apply to the Board of Trade if they thought the price should be altered, or the illuminating power increased; and at the time that was considered to be a sufficient and adequate remedy for all future differences. The present Bill does not deal with those matters at all, but is simply a measure applying for capital and land. The whole of our capital has been issued, although not all called up, but we are committed to an expenditure which will require the entire amount. The unaccounted-for gas is about 7½ per cent., which is very favourable working in a district like ours. The increase of capital is needed entirely for the purposes of future business. If we could take up a position and say we do not require and cannot take any more business than we now have, we should require no more capital, and could go on very well as we are; but we cannot do so, for we are under positive provision to supply, and are surrounded by districts in which building operations are carried on to a great extent. If the present rate of increase continues, we shall have to apply to Parliament again within 10 years, but in my opinion the increase will be much greater than 6 per cent., and, if so, the proposed capital will be more speedily exhausted. It is impossible that the auction clauses can in any way operate to the disadvantage of the gas consumers. By our Act of 1866 we were compelled to offer half of our new capital by auction, but now the whole must be sold by auction, and thus there is an extra inducement to restrict the expenditure of capital as much as possible, because any premium that arises goes into capital and bears no dividend. [Witness explained to the Committee the necessity for the additional land proposed to be taken.] The present charge for gas is not more than sufficient to enable us to pay our statutory dividends. We are earning full profits now, but we are not able to provide for the fluctuation in the price of coals, wages, and so on, although we do not seek further powers by the present Bill in regard to those matters.

Cross-examined by Sir E. Beckett: Our shares are sold in the market to pay between 4 and 6 per cent., but that would be on the assumption that they were earning full dividends. I am still of the opinion that the alteration of the burner in 1873 was worth only 1d. per candle. In over 80 per cent. of the Bills that have passed Parliament since 1866, 14 candles has been the prescribed standard, and if people want more light they should burn more gas. In the interests of the companies, it is desirable that reductions of price should take place as soon as possible, and we should like to do so now. Consumers know the difference that is made in the price of gas, whether it is 1d., 2d., or 3d., but the increase of illuminating power is something which they do not understand. It does them no good, and the company get no credit from it. It is not nearly so easy to make 16-candle gas as it is 14-candle, and I should not be surprised to see London come back to 14-candle gas at a low price. In those London Companies where 16-candle gas was not made imperative—say, for instance, the South Metropolitan and the Independent—the prices were reduced very greatly in proportion to the other Companies. The clause in the Act of 1873 with reference to the compulsory burning of 15,000 feet in the public lamps was introduced as a sort of compensation for other things which were equally new at that time. It was thought that the Corporation would have some large new districts, and that the Company, without some restriction of that kind, would be compelled to spend large sums unprofitably in taking mains into districts for public lighting, and so on. The sum of £25,000 would enable us to double our present make, but a great deal has to be done with the gas after producing it. For instance, we should have to spend £50,000 on mains; there will also be the enclosures upon the land, the defence of it, and the levelling and bringing it into use, and I have an estimate of £99,600 for that. In the previous inquiry no reference was made to details; I merely stated that for every million feet of gas sold we should have to provide a capital of from £800 to £850. It will take 100,000 cubic yards of ground to fill up the inequalities of the land, and, at 2s. a yard, that runs away with £10,000. I shall require for condensers, purifiers, plant, machinery, engines, and so on, about £22,400. I shall want for additional buildings, other than that to which the £25,000 applies, about £6500. I shall also want, for the purposes of a wharf and a new coal-discharging apparatus, just double what we have at the present time—£8000. Then there are a lot of sundries, which I put down at £3200; and I think before eight years are over we shall have to deal with some new offices, which will probably cost £4200. Altogether it will add up to £99,600; then about £50,000 will go for mains, and about £32,000 will be required for additional storeage, making a total of £182,180.

Witness was being cross-examined by Mr. Granville Somerset on the question of a special audit by the Hove Commissioners, when

Mr. Michael, interrupting, said he was perfectly willing, on the part of the Gas Company, to say that they might have an auditor present at the audit.

Mr. Somerset: According to the 20th section of the Bill, if you obtain five acres of land by agreement, you may use the land for a gasholder?

Mr. Michael: But that is contrary to the law, unless it is with the consent of the owners and occupiers within 300 yards; otherwise you cannot so use it.

Witness said a clause had been offered to prevent the land being used for the erection of gasholders, and if the Bill passed that clause would be inserted.

In re-examination by Mr. Michael, *witness* stated that clauses had also been communicated to the Hove Commissioners, providing that the accounts of the Company should be sent to them the same as to Brighton; that a map of the mains should be deposited with the Clerk to the Commissioners; that a copy of the model burner should likewise be deposited, and that the Commissioners should be at liberty to send an accountant to attend the audit. Those clauses were tendered now as they had already been tendered in the House of Commons.

Friday, May 9.

Mr. *G. W. Stevenson*, examined by Mr. Michael.

I have known the Brighton and Hove Gas-Works intimately since 1866. I was surprised to hear Mr. Spice give evidence in the House of Commons that there ought to be some improvement in the construction of those works, as I know of no better gas-works in the kingdom.

Mr. Michael: We were told by Mr. Spice that some improvements might be made by which a very large economy of space might be obtained. Do you know to what he referred?

Sir E. Beckett said he did not propose to trouble the Committee about economy of space, but should confine his attention to the questions of price and illuminating power.

Examination resumed: The present cost price of gas—which is manufactured as well as it can be done under the circumstances in which

Brighton is placed—is 2s. 5½d. per 1000; and, besides that, 1s. 1d. is required for dividend on the existing capital.

Sir E. BECKETT: What kind of dividend do you mean?

Witness: The authorized maximum dividend.

Cross-examined: A considerable portion of the capital is limited to a dividend of 7 per cent. The Company must also expend immediately a large sum which will not be remunerative for some time; they must make large additions to their works, and wait for business to grow for the profitable use of those works. I have added 2½d. for that, which brings the total selling price of gas to 3s. 9d. The price in the existing Acts is 3s. 6d., and it is not proposed to interfere with the price by the present Bill. The Company have other sources of income than that derived from the sale of gas, or there would be an absolute deficit immediately they had constructed those additional works; for instance, they have meter-rents. The Company have not been able to pay their statutory dividends over the whole period of their existence; in fact, a great many thousands of pounds would have to be paid to the Shareholders before that would be the case. The illuminating power of the gas cannot be increased without the cost being likewise increased. The Brighton Corporation have power to call upon the Company to increase from 14 to 15 candles upon payment of 3d. additional; and there is also a revision clause, by which the Board of Trade can determine whether the price should be lessened; but neither of those steps have been taken. During the years 1877 and 1878, out of 32 Acts or Orders, 14 candles was prescribed in 25 cases; 12 in one; 15 in two; and 20 in one. The latter instance was a company in the heart of Scotland, where the works were in the middle of the cannel. When the process of distilling simple coal for the purpose of obtaining gas is departed from, cannel must be added in an increasing proportion for every candle upwards. It cannot be said that it costs 1d. per candle from 14 to 20 candles, but the cost of each candle increases gradually, on account of the increased amount necessary of the higher illuminating material. If the coal that is being carbonized is of equal quality, there should be no difficulty in determining within half a candle what the illuminating power would be at a distance of four miles. An illuminating power of 14 candles is a very good standard. There are some Companies in London at the present moment under an obligation to supply only 12 candles, but the highest obligation any Company is under in the Metropolis is 16-candle gas for a price of 3s. 9d. The Gaslight and Coke Company sell 10,000 million feet in a year, and 1d. per 1000 feet represents more than £40,000. The Brighton and Hove Company sell 304 million feet a year, and 1d. represents about £1200. There is the greatest difference in the world between putting 16 candles at 3s. 9d. upon a Metropolitan Company, with their enormous business and very close sale of gas, and putting 16 candles at 3s. 6d. upon a Company like this, with their very large and scattered district. The present capital has been raised upon the price fixed in the Acts of 3s. 6d., and on an illuminating power of 14 candles. If anything is taken off that by raising the illuminating power, the dividends to the Shareholders will be reduced; and therefore it would be revising past legislation, and inflicting a loss upon the persons who have subscribed their money on the faith of the 3s. 6d.

Cross-examined by Sir E. BECKETT: I do not think there has been any issue of fresh shares since 1873, in which year there was legislation in respect to the Company.

Sir E. BECKETT: And it revised past legislation for the benefit of the Shareholders?

Witness: Past legislation is being constantly revised.

It was a revision of past legislation for the benefit of Shareholders under the prospective coal famine?—Yes; it was of a temporary character.

Will you mention, besides the meter-rents, what are the other sources of income which the Company have in addition to the gas?—If they sell fittings, they may make a profit by them; that is all.

Not quite all, because the 3s. 6d. does not rule over their whole district?—No; but it is the bulk of the consumption.

They have 4s. 6d. in Hove?—Not in Hove; but in Portslade and Shoreham.

What do you give as the difference between Sugg's burner and the old burner—how many candles?—Close upon 2 candles; but it is quite possible to make a burner (and I have one myself) which will answer the description of the old burner, and give a result equal to Sugg's "London" burner—that is, a 15-hole Argand burner, with a 7-inch chimney.

Mr. *Alfred Penny*, examined by Mr. WILL.

The Brighton and Hove Gas-Works are really, as described by the last witness, model works. With regard to the questions of illuminating power and price, I concur entirely with Mr. Stevenson; and I may state that there are only four gas companies in England which have a standard price lower than that fixed in the Brighton Act; in two cases the illuminating power is the same, in one case 1 candle lower, and in the other case 2 candles lower, but this arises from the fact of those companies being in the heart of a district where there is coal of a higher illuminating power than is available to this company.

By the CHAIRMAN: One case is Newcastle, the maximum price being 3s. 4d., and standard illuminating power 14 candles. The next is Sheffield, with a maximum of 3s. 3d., and standard illuminating power 15 candles. The next is Rotherham, where the maximum price is 3s. 3d., with an illuminating power of 16 candles. The other one is Leicester, with a maximum price of 3s. 4d., and an illuminating power of 14 candles.

Mr. WILL: Those places being much more favourably situated than Brighton with reference to getting coal?

Witness: There are various circumstances connected with the amount of capital and other things which it is hardly, perhaps, necessary to go into; but I may say that in my experience it is customary for Parliament to give such a standard price as will allow for some contingencies, while in this Bill there is really no margin whatever for contingencies. The accounts show that it has been necessary to charge the maximum price for gas to enable the Company to divide, not the statutory dividend, but a lower dividend, sufficient profits not having been earned to pay the statutory dividends. Therefore, 3s. 6d. as a maximum is so low, that it could hardly be made lower with any regard to the interests of the Shareholders.

Sir E. BECKETT (in cross-examination): Though there may be only those four companies that have a less price than 3s. 6d., there are many companies selling for much less?

Witness: There is no doubt there are companies charging less, but there are circumstances connected with them that may justify them in so doing.

You say this Company have no provision for contingencies; but they manage to keep a very comfortable balance in hand?—I do not know that; they have not yet paid their statutory dividends.

Talking about statutory dividends, you gas people seem to think that gas companies are different from railway companies. You know there is a maximum dividend of 10 per cent. for railways, but we do not talk about these companies as being entitled to 10 per cent.?—The dividends of this Company do not amount to more than 8 per cent. upon the capital employed.

That is not my question. Railway companies are just as much authorized to earn 10 per cent. without the interference of Parliament as gas companies?—Yes; they would earn it if they could.

But Parliament does not let them, because it keeps down their fares. When you think it worth while to distinguish between different classes of capital, you know every railway company have a very large proportion of capital at a much less dividend than 10 per cent.?—Yes.

Its preference capital is generally 5 per cent., and very seldom higher than 6 per cent.?—As regards the capital now asked for, it is never likely to receive more than 5 per cent. dividend upon it.

So it was said in 1873?—These shares having to be sold by auction, the amount of premium will, by the Standing Orders, go to capital without receiving any dividend upon it.

That will depend upon the prosperity of the Company afterwards?—Yes.

Re-examined by Mr. RICHARDS: If they had a lower maximum than 3s. 6d., there would be no inducement to give a premium for the shares, because they would produce an insufficient dividend. If the Company had paid their maximum dividends, the balance would disappear.

That being the case on behalf of the promoters,

Sir E. BECKETT said there were only two points in the Bill upon which he thought it was necessary to trouble their lordships. The petition adverted to a third point—viz., the increase of capital—but, inasmuch as the Corporation had succeeded in getting a reduction of £100,000 from the Company's demands in the House of Commons, he might say at once that, if he could obtain the two other things now asked for, his clients would be content to run the risk of the Company going on for whatever time it might be before they applied to Parliament again. The Committee must have seen that the real reason why all public bodies were so anxious to obtain large increases of capital was, that it enabled them to keep out of Parliament, because they knew that every time they made such applications there was an opportunity of revising past legislation and redressing past grievances. Of course, one could not foresee what grievances there might be ten or twelve years hence, but the probability was that there would be some, because there always had been. In the present case, there were two which had attracted attention—those of price and illuminating power. The point with regard to price was explicable in a very few words. In 1866, for some temporary or local reason, the Company were allowed to put upon the Corporation that curious restriction of not supplying any public lamps unless they consumed 15,000 feet a year. At that time the town was extending in some directions, and the Company might have thought that, unless some restriction was imposed, they might have been compelled to put up lamps, or find gas for them, involving an expenditure without a proper return. But there was no pretence that any such reason existed any longer, and therefore the legislation founded upon that reason ought also to disappear. One consequence of that restriction was, that it prevented the Corporation from lighting certain parts of the town and suburbs during a portion of the year, because the total quantity consumed would not amount to 15,000 feet. That was a restriction without precedent, and therefore the Committee would be asked to strike out that clause. The second point was a very simple one, though it might require a few more words. In 1873 the Company applied to Parliament, saying there was a coal famine, and if they were not allowed to get more profit in some way or other, they would be unable to pay any dividend at all. Parliament believed them, and, against opposition, thought fit to give them a special relief—which was given to no other Company in England—viz., the benefit of 6d., which was to last for a year only, and the alteration of the burner, which was of the value of two candles. The Corporation did not ask for any alteration in price, but they wished to have matters replaced as they would have been if the legislation of 1873 had not taken place. If the Company had been left under the General Act, with the power of applying to the Board of Trade to obtain a rise in price, they would not have got the alteration in the burner, because such a case was not provided for. If anything turned out wrong hereafter, or anything oppressed them, they had a special power, which no other Company had, of going to the Board of Trade for a revision of price. Therefore they could not complain that, by any conceivable possibility, a return to the standard existing before 1873 could do them any harm in point of money; or, if it did, they had their remedy. The inhabitants of Brighton attached considerable value to the illuminating power, the same as the people in London; and though there were a few Companies in the Metropolis who had escaped the legislation which was applied to all the greater concerns with regard to the 16 candles, they were very few indeed. The Gaslight and Coke Company were under that obligation, and therefore, practically, so was the whole of London. Whichever way the matter was looked at, it came to the same thing. The quality of the article which the Company were required to supplyunder the Act of 1873 was two candles more than they were required to supply before. A deficiency of income and back dividends had been mentioned, but those were phrases which had been acquiesced in from being asserted so often, although there was a fallacy in them. The 10 per cent. of gas companies was the same as the 10 per cent. of railway companies. They might earn it if they could, but they must earn it under fair circumstances, and under such restrictions as Parliament thought fit to impose upon them. There was not a railway company in England that paid anything like 8 per cent., and why should gas companies? Mr. Stevenson said that the Shareholders had taken their shares on the footing that they should get that large income; but he forgot that all the capital had been issued under the Act of 1866, and therefore that was no grievance. The fresh capital was to be issued upon such conditions as the Committee thought fit to allow, and all they were asked to do was to restore the burner by which the gas was tested before 1873. The Corporation also wished a condition to be inserted in the Bill, compelling the Company to supply lamps on the ordinary terms, and not on those special and peculiar terms which were invented for a temporary reason—viz., of supplying the lamps with not less than 15,000 cubic feet in the year.

Mr. GRANVILLE SOMERSET, on behalf of the Commissioners of Hove, said that, after the observations of Sir E. Beckett, he would not waste the time of the Committee by making any observations, especially as he did not raise any contention about the preamble.

After a short discussion, the committee-room was cleared. On the counsel and parties being re-admitted,

The CHAIRMAN said: The Committee are of opinion that it is desirable to proceed with the Bill, and they have decided not to interfere with the legislation of 1866 and 1873, with regard to illuminating power and price.

The clauses were then proceeded with. On clause 3*b*,

Mr. SOMERSET said that in section 22 of the Act of 1866 there were certain provisions for the publication of accounts, which were inserted at the instance of the Corporation of Brighton. The question now arose whether the clause inserted under Lord Redesdale's direction [incorporating the Act of 1871] did not repeal that publication—that was to say, whether it did not interfere with section 22 of the Act of 1866. If it did, then a certain provision was taken away, which was granted by Parliament at the intercession of the Brighton Corporation, and agreed to by the promoters in 1866.

Mr. REES (Parliamentary Agent) said that the Corporation of Brighton

—at whose instance the clause in the Act of 1866 was inserted—were quite willing that the modification now proposed should be made.

Mr. RICHARDS said the matter need not be discussed any further, if the Corporation agreed to the proposal. The only feeling of the Company was, that they were doing something behind the backs of the Corporation.

Mr. REES asked what was the decision with reference to the 15,000 feet limit.

The CHAIRMAN: We have decided not to alter the legislation of 1866 at all.

On clause 25c, providing for a map of the mains being deposited with the Hove Commissioners,

Mr. SOMERSET suggested the addition of the words, "on a scale of not less than 2 inches to 1 mile."

Mr. MICHAEL agreed, and the clause, as amended, was passed.

On the model burner clause,

Mr. SOMERSET proposed to add the words, "and verified as provided by section 7 of the same Act," which was agreed to.

The CHAIRMAN (to Mr. Somerset): With regard to a clause as to the accountant, have you any alteration to propose?

Mr. SOMERSET: I propose to substitute "auditor" for "accountant" throughout.

The alteration was agreed to.

Mr. SOMERSET suggested the following addition:—"And such auditor shall be paid by the Commissioners, and shall have the same powers as the special auditor appointed under section 21 of the same Act." Those words were suggested in consequence of the remark of Mr. Padden, that the Company would have no objection, provided they were put to no inconvenience or expense. He (Mr. Somerset) also thought it ought to appear on the face of the clause that their auditor should have whatever power the Brighton Corporation had under section 21 of the Act of 1866.

Mr. MICHAEL said he assented to that, as he thought it was only fair.

The remaining clauses were then read and agreed to, and the Chairman was directed to report the Bill, as amended, to the House.

THE SELECT COMMITTEE ON LIGHTING BY ELECTRICITY.

FIFTH DAY—TUESDAY, MAY 13—(*continued*).

(Members present: Dr. Lyon Playfair, in the chair; Mr. Alfred Gathorne-Hardy, Mr. Hardcastle, Mr. Mitchell-Henry, Lord Lindsay, Mr. Arthur Moore, Earl Percy, Mr. Puleston, Mr. Christopher Talbot, and Sir David Wedderburn.)

Mr. *Corbet Woodall*, examined by the CHAIRMAN.

I am a Member of the Institution of Civil Engineers, and Engineer-in-Chief of the Phœnix Gas Company, London.

The CHAIRMAN: The Committee would be glad to know your opinion upon the likelihood of electric lighting interfering with the present monopoly, which the gas companies enjoy, of lighting large cities?

Witness: In the first place, I can hardly agree that the gas companies have an absolute monopoly of the lighting of large towns and cities. The powers that are granted to gas companies do not absolutely prohibit competition, except in the Metropolis.

I was rather referring to the Metropolis. The Metropolis is now districted, is it not, amongst the Gas Companies, and the Companies have a practical monopoly in lighting their districts?—That is so.

Does the Legislature impose certain strong restrictions upon Companies in the exercise of that monopoly?—It does so; for instance, we are required to provide, for everybody who may apply for it, an efficient supply of gas, assuming, of course, a certain distance from the mains of the Company already laid, which practically extends to every portion of the district granted to the Company. We are required to supply the gas to those consumers, of an uniform illuminating value, and above a certain minimum of purity. We are also required to light public lamps, provided that they are not at a greater distance apart than 75 yards, even although it may involve the laying of mains with no other consumption upon them, as it very frequently does. Then the price to be charged for public lamps is fixed at the lowest charge to any private consumer. As to the dividends of the Companies, they are limited by Act of Parliament, and any profits made beyond what is necessary to pay those dividends must go in reduction of the price of gas. Facilities are given to a small number of private consumers to ensure that the accounts shall be thoroughly audited, so as to make quite certain that all that is due to the consumer is given to him in the shape of a reduction in price. All these limitations are imposed upon the Companies when powers are given to them. In return, we have a monopoly in regard to the use of the streets for laying down our gas-pipes; but that monopoly does not interfere with any individual consumer or ratepayer erecting his own gas-works, if he cares to do so; of course, running the chance of being indicted for a nuisance.

Just as I can by theory, in law, run my carriage along a railway, if the signals did not prevent my doing so, as the railway is a public road, and every man can run his carriage along a railway if he chooses, but nobody does?—I was not aware of the fact; but I may say that the parallel is hardly accurate, because this power is availed of by a considerable number of persons, and certain establishments—railway companies and others—erect their own gas-works, and supply themselves with gas within the limits assigned by Parliament to gas companies. Large factories and companies would be able to do that, and sometimes even small factories; I know one or two in my own district that do so. Still they cannot break up the streets. They may supply their neighbours over private property; for instance, if the premises behind or in front of the houses were contiguous, then it would be possible.

Examination continued: Our profits are limited to 10 per cent. upon old capital and 7 per cent. upon capital of more recent creation. I may say that, with regard to the limit of 10 per cent., as a rule, in very early years, gas companies did not pay any dividend at all, or very small ones. The dividend paid by my Company never reached 3 per cent. before 1851; in 1851, it was 3¼ per cent.; in 1852, it was 3½ per cent.; and so it went on, with a steady increase of about one-half per cent. per annum, until in 1862, for the first time, the Company paid 10 per cent. upon their capital. So far as we at present know, conditions such as I have described—that is to say, restrictions laid by the Legislature upon the supply of gas to a district—could certainly not be applied to a company proposing to distribute the electric light in a similar manner. I think it would be well if I mentioned one or two other conditions of gas supply which would point more specially to the impossibility of that being so. For instance, we very often have to meet a sudden demand for gas. During fogs the consumption of gas on a winter's day, which had been equal to, say, 40 or 50 per cent. of the quantity of gas being made, will suddenly jump to 250 per cent.; so that we are obliged to have a reserve in store to meet such a contingency. One point which strikes me with reference to anybody supplying the electric light outside his own premises is that in case of such a demand it would be exceedingly awkward for people to have to wait two hours in a London fog whilst steam was being got up in order to produce the necessary power. I do not think that, in the public interest, conditions could be imposed upon electric lighting companies of a character similar to those which are imposed upon gas companies. I can hardly conceive it possible that it could be made a condition, for instance, in the case of an electric lighting company, that they should, without choice of positions, supply the light to anybody who might require it. At present we have heard nothing of any system that would enable a company to lay a line of wires, and send off branches into separate houses or premises, unless you assume, as I think Lord Lindsay pointed out in the last witness's evidence, that the power goes on continually being expended, whether the light is being employed or not. There is another point, that gas companies are put under limitation as to the amount of land that they shall hold. They are only allowed to carry on their business upon land that has been properly scheduled, and to the people in the neighbourhood of which proper notice has been given. With the electric lighting companies it would be almost impossible to have any conditions such as that; they would, practically, need to have unlimited powers to purchase or lease premises, or to erect buildings at frequent intervals. I cannot conceive at all why parliamentary powers should be applied for by electric light companies, because, if it is not necessary to open the streets, then they have all the powers that they can possibly require. Any person could do, for instance, as Mr. Shoolbred has done; that is to say, could purchase machines from the maker, and supply himself with the electric light; or he could contract with any company to supply him with the electric light, by paying for it.

The CHAIRMAN: But are you not aware that the absence of power prevents extension? There is one case of a large shop which desires to have the electric light, but it can only have the machine in the opposite house, and the Vestry refuse permission to carry the wires under the street. Do you not think that, in such a case, they may fairly ask for parliamentary power to do such a simple thing as carry the wires under the street to the shop opposite?

Witness: That is a position which has never occurred to me; I think it is a hardship.

Of course wires can be carried over the street with the same efficiency as under the street; but supposing that the electric light comes to be a practical mode of lighting, do you not think that companies should, under some condition or another, have the power of carrying their wires under the streets?—I certainly think it would be unadvisable and unnecessary to grant general powers of opening the streets, such as those enjoyed by a gas or water company, for the mere purpose of meeting a solitary or very rare contingency such as that, and the general tendency of the evidence here has, I think, been, and the experience generally has been, against such power being granted.

It has been given in evidence that the Corporation of Liverpool want to illuminate the large space before the Lime Street Station, and that they are unable to carry out experiments for illuminating that large space, because they have not the power of opening the streets. If the witness was right, would you not think it very reasonable that they should have legislative power for the purpose?—I confess I regard that power being conferred upon municipal corporations with much jealousy; and for this reason—that for mere show purposes, or what not, the unlimited funds of the ratepayers might be employed to the detriment of gas companies. I say to the detriment, more from the point of view of the market value of property, than of the actual loss to the company.

That, of course, is your natural view as the Engineer of a Gas Company. We are likely to receive evidence, on the other hand, from corporations, that they desire to purchase gas companies, and to get greater powers in order to light their own cities?—Yes; usually I think those powers are sought more with a view to making profit, than to improving the lighting of the towns.

Examination continued: It is a matter of very rare occurrence for any interruption to take place in the supply of gas, and I think it is very marvellous, considering the enormous number of gas lights burning, that there are so few interruptions. A general interruption is a matter almost unheard of. In my own experience I never knew but one case where the lights of a district were put out. I made a note of a remark on gas lighting by Mons. Fontaine, which seemed to me as being apposite. He says: "We have never so much admired the facility of employment, the simplicity of installation, the indefinite divisibility, and the multiplicity of the uses of gas, as since we have been occupied with lighting by electricity." It has struck me, in looking at the difficulties that appear to beset electric lighting, that it is only when so regarding them that one properly appreciates the exceeding convenience of gaslight. A gas-engine is unquestionably an economical machine in a great many situations, and I have no doubt gas-engines will come into greater use; but I do not anticipate in consequence any very large increase in the consumption of gas. Having paid particular attention to it, I think that the mere conversion, *per se*, of 300-candle power of gas into a greatly increased electric light, does not at all represent the value of the two lights when obtained. Judging by my own experience of gas-engines, I am a little surprised at the exceeding favour they are held in for electric lighting purposes, because I do not find them, when worked economically, quite so steady in operation as a steam-engine. For small engines they are much more convenient; and there is one great convenience about them, that the insurance people take no notice of their being on the premises, as they require no boiler and no fire. I have no fear that, in its present state, electric lighting will enter into any active competition with gas inside houses. I believe that, as matters stand, it would be necessary to have telegraphic communication from the user to the producer of the electric light, in order that it might be turned on or shut off, otherwise waste would go on. There is one other difficulty. There is an almost universal tendency on the part of gas consumers to add to the number of their lights; so that a supply which was originally put in for, say, 10 lights, grows to have to do duty for 40 or 50. Gas companies discover it partly from increased rental, and by-and-by from there being complaints of want of supply. That points to one facility in the use of gas which would be impossible with the electric light, because, so far as any system goes that we have heard of at present, a radical re-arrangement would be necessary if an additional light or two were required. The Local Authorities have the entire control over the amount of gas to be burnt, the distance apart of the public lights, and so forth. We simply supply the gas, and receive payment for what we supply. I should like to mention a little experiment that was performed by my Company, at my suggestion. After seeing the lighting at the Avenue de l'Opéra, in Paris last July, I advised my Directors to give an illustration, in some road in our district, of generous lighting, though not aiming at the extravagance, as I regarded it, of that particular exposition. They agreed to the arrangement, and, with the consent of the Lambeth Vestry, we took the road extending from Waterloo Bridge to the South Western Terminus—a length of something like 500 yards—and displacing the old lanterns that were up, 22 in number, about 60 yards apart, I put up lamps at 20 yards apart. We improved the lanterns by fixing reflecting tops, and doing away, as far as possible, with everything that would cast shadows. We also increased the consumption of gas from 5 feet to 6 feet per hour each lamp. Then at certain points on the road, Mr. Sugg fortunately at the moment coming to our help with his large burners, we put up some of 150 to 200-candle power. Before making the alteration, it may be interesting to mention that the total cost to the parish for the whole length of that 500 yards was

5½d. per hour for lighting, repairing, and maintaining the lamps. The alteration involved the erection of forty lamps burning 6 feet of gas per hour, two burning 40 feet, four burning 20 feet, and four burning 15 feet; because near the bridge, we put a few large lamps so as to see how far it was economical to have a few great light-centres rather than numerous small ones. The total gas burnt under the altered conditions was 460 feet per hour, and the light given was 1420 candles, as against slightly under 130 feet per hour previously burnt, giving a light of 300 candles. So that you will observe that the increase in the illuminating value is greater than the increase in the gas consumed, because the burners used were far more economical in their results. In the one case I estimate that a burner consuming 5 feet of gas is equal to something like 12 candles—which is the actual fact, slightly over 2 candles per cubic foot—whereas, with the large burner, we get a result equal to 4 candles per cubic foot. The cost of this alteration came to £362, including the maintenance of the lamps—or 1s. 8½d. per hour, against 5½d. As, however, this amount of light was palpably extravagant after midnight, I had half of the lamps turned out at that time, so reducing the cost by one-fourth as regards the expenditure of gas, and the price per hour to 1s. 4d. In order to accomplish the same effect with the electric lamps, I estimate that the road could not be efficiently lighted with Jablochkoff candles at a less distance than 50 yards apart. I reckon this because those on the Holborn Viaduct, which were 60 yards distance from each other, were palpably and evidently much too far apart—worse lighting than that I have rarely seen. It would therefore require 20 such lamps to give the same effect, and taking those at the cost that was at that time being paid in Paris—viz., 1 franc 25 centimes per hour—the cost came to £4200; or, at 9d. per hour, which was the price ascertained by the Metropolitan Board of Works experiments to be the cost at that time on the Embankment, it comes to £3150. At the present price of 5d. per hour it would be about £1600 per annum as against £360. At 9d. it comes to 15s. per hour exactly, for that which, as I have already said, is accomplished by gas for 1s. 8½d.

The CHAIRMAN: Of course you are aware that, in the one case, your cost of management, or the cost of producing the light, is distributed over all your district, whilst in the case of the Holborn Viaduct the cost was upon a single experiment; and in the case of 5d. upon the Thames Embankment, the cost is upon 20 lights, when they can, with the same engine, produce 60 lights; therefore, the comparison is scarcely a fair one as against electric lighting?

Witness: The comparison is not a fair one reckoned upon the interest on the first cost; but I think I need not remind you that the power for 40 lamps must be twice that which is required for 20 lamps.

That is not what is stated. What has been stated in evidence is, that the engine which is now used for working the 20 lights is quite able to produce 60, and that therefore, of course, all that cost is upon the 20 lights?—All the working cost would be increased in proportion, I take it, to the increase in the number of lamps; but the cost due to interest would be the same for the 40 as for the 20 lights. An engine such as that employed there, which now is, I understand, putting out a power of from 23 to 24 horses, would put out a power of 46 horses in order to light 40 lamps, and, consequently, the expenses would go up in the same proportion. I believe it has been suggested that roads should be lighted by lights of greater power, fixed at a height of 45 feet, and at a distance apart of 100 yards. I have looked at that this morning, and I calculate that, allowing for the fact of the diminution of the light with the square of the distance travelled, the result would come out very unsatisfactorily; for, if the electric lights were placed at a height of 45 feet, and 100 yards apart, they would need to be of 610-candle power, in order to give the same effect, at the point of minimum illumination, as gas lights of 20-candle power placed at 20 yards apart; and that collectively, for instance, for lighting the 500 yards to which I have referred, there would need to be used five times 610 candles; that is to say, 3050 candles, as against 1420 candles in the case of the gas light.

That would be true for street lighting, but it would scarcely be true for lighting a large symmetrical space like a square, where the distribution would be wider?—I have allowed that the lights in this case were in one line down the centre of the street, so as to light round universally; but I think that the advocates of electric lighting have certainly made a great mistake in making their great expositions in public streets as opposed to large areas.

Have you continued the lighting in Waterloo Bridge Road?—That lighting was done at the expense of my Company, of course. We only asked permission for three months, and at the end of three months we wrote to the Vestry, thanking them for the facility that they had given us, and requesting their guidance as to what was to be done with the lamps. The Vestry have not yet determined to retain them, but I can hardly conceive it possible that they will, because it would involve so general a demand for the same amount of illumination; but I may say that, so far as the crossings are concerned, they have resolved to keep the large lights there, and they have requested me to light all the important centres of traffic in our district—for instance, the approach to London Bridge Railway Station—in the same manner; and several other Vestries are proposing to do the same thing.

Do you not think the electric light is doing you a great deal of good, and the public also, by stimulating you to give a larger amount of illumination?—I am quite sure that the interest excited by the electric light has done the gas companies good, and I believe it will continue to do so.

By Mr. GATHORNE-HARDY: My own feeling is, that while, where the traffic is considerable, the streets might well be lighted to a much greater extent than at present, the ratepayers generally would hardly stand the expense of a very large increase in the amount of illumination in the general streets and thoroughfares of our towns. As to the uniform illuminating value and purity of the gas supplied to London, there have been complaints occasionally, that the Companies have failed in their duty to the public in that respect; but inasmuch as the Legislature has provided that severe penalties shall be recoverable at any time when such complaints are proved, I think I may fairly state that such complaints, as a rule, have not been reasonable. I am decidedly adverse to granting electric lighting powers to gas companies. I think that there is no similarity between the two businesses, and that if there were a loss upon the experiment of electric lighting (and every new business has an experimental stage), it would be thrown upon the purchasers of gas, and that would be an unfairness to them. Granted that it was necessary, in order to distribute the electric light, that the power of opening the streets should be given, I should say that it would be unreasonable, if one body declined to take up the work, to refuse it to another. My position has rather been, that there has not been a case made out yet of any such necessity having arisen, and that therefore it would be an unnecessary thing to grant such powers where they could not be availed of. Assuming that there is a general demand, and an obvious improvement in electric lighting, as compared with gas, for certain purposes, I certainly should think it an unreasonable thing to refuse the powers, if the gas companies did not themselves agree to exercise them in the first instance.

Mr. GATHORNE-HARDY: With reference to parliamentary powers, you have the power now of opening the streets; but is it not possible that other parliamentary powers might be required for the purpose of lighting by electricity; for instance, they might require power to take land for the purpose of using their engines. Then assuming that Dr. Siemens's evidence was correct as to lighting from a height, they might require power to build certain towers in different positions and open spaces, and take land for the purpose of reflecting the light downwards. Would you say that such powers would not interfere with your monopoly of opening the streets, and would you have the same objection to such powers being granted?

Witness: I should have a general objection to such powers, on the ground that the electric light station, with the engines and boilers, could hardly be instituted next door to my house, for instance, without its being a grave inconvenience and annoyance; and, therefore, it would have to be fenced round with a great many careful provisions lest it should become a nuisance to the neighbours. That was the only reason why I mentioned the question of land and houses.

With reference to the Public Health Act, it is no doubt the case that, under that Act, corporations have power to open the streets for the purposes of the Act, that is to say, in certain cases for water and for drainage; but is it the case that they have the power of doing so for the purpose of lighting?—The 161st section of the Act says: "Any urban authority may contract with any person for the supply of gas or other means of lighting the streets, markets, and public buildings in their district."

You are restricted to a 10 per cent. dividend, but is it not the case, with some companies at any rate, that before they reduce the price of gas to the public, they may pay back dividends up to 10 per cent.?—The Gas-Works Clauses Act of 1847 gave such power, and it was availed of to a certain extent. By the Metropolis Gas Act of 1860 the Gas Companies of London were restricted to the payment of back dividends beyond the previous six years.

By Mr. ARTHUR MOORE: We are not allowed to establish gas-works at any point we please. The restrictions are that we have to name, in our application to Parliament, the position of the land we propose to occupy; and the Gas-Works Clauses Act of 1871 requires that we shall obtain the consent of the owners, lessees, and occupiers of all property within a certain range. Those restrictions are imposed, I presume, in the interest of those who would naturally regard the near neighbourhood of gas-works as not desirable for their property. There is usually a considerable quantity of smoke arising from gas-works; but no vapour that is noxious to vegetation or to human life. There would not be any smoke at all in the case of works of corresponding size for the purpose of producing the electric light if they used coke for the engine.

By Mr. CHRISTOPHER TALBOT: We have works at Vauxhall, Bankside, and Greenwich; and over the whole of our district we have a practical monopoly, so that no other gas company could lay down pipes in our territory.

By Mr. HARDCASTLE: Gas companies, in the nature of things, come to Parliament usually about every 12 to 15 years. At the period of their application, any conditions can be altered by Parliament, as it may see fit. Parliament never grants unlimited power of raising capital, and usually the growth of gas companies is such, that in a period of 10 to 14 years the business has doubled, and therefore the capital permitted to be raised has been expended, and they must needs come to Parliament for more. Apart from increase of capital, there would be no necessity to come to Parliament, except for the acquisition of more land. Any company can come to Parliament and ask for powers, and Parliament may grant those powers at any moment, in competition with the company already established and holding parliamentary powers. Take, for instance, my own Company. We had power granted to us in 1824, and confirmed subsequently several times; but any other company might be formed to supply gas within our district, and might come to Parliament, and if Parliament saw fit—if a case were made out that the supply had been badly fulfilled by my Company—such power would be granted to the competing company. My experience is that gas of the quality supplied to London is what is most generally useful. Not very long ago there was a supply of 20 to 22 candle cannel gas in London. The consumers of that gas were very glad indeed to change the supply for ordinary 16-candle gas, at a proportionately reduced price. I am of opinion that the illuminating power of London gas might be increased, but that it would not be desirable, and that consumers would not care to have it increased. Certainly, from year to year, the purity of the gas is being improved, although the amount of impurity remaining in coal gas has, for many years, been so exceedingly minute, that there is very little material left to work upon. I have an illustration of the quantity of impurities given off. In a room ordinarily lighted with coal gas, the proportion of sulphurous acid, which is the impurity discharged into the atmosphere, was not greater than was the normal condition of the atmosphere out of doors of Manchester. Or, to give another illustration, in a room with three gas-lights burning, the quantity of sulphurous acid discharged in the course of five or six hours would not be more than would be given by the striking of one lucifer match, assuming the presence of the proportion of sulphur allowed by Act of Parliament. This will show that the amount which we have to work upon in the form of increased purity is not considerable.

Earl PERCY: You spoke of the tendency which consumers of gas have to increase their consumption, and you foresaw in that fact a difficulty with regard to electric lighting. I suppose that would depend upon the power of the engine, would it not?

Witness: No; I take it that it has been established that only a limited number of lights can be put upon one circuit. If you want more lights, it would be necessary either to bring a fresh supply into the house, or to re-arrange the circuit upon which you desired to put more lights.

At the last meeting of the Committee, Mons. Berly was asked whether he could produce 40 lights instead of 20 lights out of the 20-horse power engine on the Embankment, and he answered that the engine at first worked 20 lights; they were then putting another 20, which had been tried experimentally, and which he knew would work, and he had no doubt that another 20, and perhaps more, would be added. Would not that meet your objection to a very great extent?—Not at all; because, as you are aware, there are carried from the generating station on the Embankment four or five wires, on each of which are a certain number of lights. Evidence has been given here, I think, that the number of those lights cannot be increased on any particular circuit without a very considerable loss of light. Therefore, inasmuch as each of the circuits is practically one complete supply—because, after all, the Gramme machine from which four circuits are taken is only several machines rolled into one—off each individual circuit it would be impossible to take more lights without bringing a fresh wire from the machine.

By Sir DAVID WEDDERBURN: Anything like a sudden and unexpected failure of gas supply on a large scale is a very rare and unusual event. Local defects may arise from many causes. I mean a general failure. In my experience of some 20 years I can only remember a general failure in a district upon one occasion. Any difficulties in providing a permanent and steady supply of the electric light should certainly diminish with experience and practice.

Sir DAVID WEDDERBURN: You are doubtless aware that, in some establishments, such as clubs, where expense is not a very important object,

after the adoption of gas sun-lights in some of the large rooms, they have abandoned those lights on account of the heat, or smell, or various other inconveniences, and have fallen back upon candles and lamps?

Witness: I am not aware of such a case, although I take it that such is the fact.

I was going to ask if you thought it at all probable that, after the electric light had been adopted in any such way, the advantages of gas are such that there would be any probability of reverting to gas lighting after the electric light had been once tried?—I think that my best answer will be to refer to the experience we have had, so far, of the electric light, where it does seem to have a disposition to vanish after a time. Very many cases have already been before us where the electric light has been used, and abandoned after trial, sometimes on the ground of expense, but I think far more on the ground of imperfections in steadiness and uniformity of light; certainly not on account of any sanitary drawbacks.

Has your attention ever been called to the effect produced upon flowers, and especially upon certain kinds of flowers, by being grown or cultivated in rooms lighted by coal gas?—I know that, in most rooms lighted by gas, or lighted by other means, it is very difficult to make flowers grow satisfactorily; but I should like to say, when you speak of reverting to candles after having used gas, that one thing is clearly established—viz., that, light for light, gas is a far more sanitarily perfect light than candles. Light for light, the destruction of the atmosphere of a room is far less—I believe, in the proportion of 3 to 1—in the case of gas than with the very best candles. I mean as regards the consumption of oxygen, and the production of carbonic acid gas.

There is no doubt, I think, that in a room where gas is permanently or continuously burnt, there are generally manifestations of the presence of sulphur in the atmosphere, in the blackening of metals, and also in the effect produced upon plants?—I must say that I am not conscious of the presence of sulphur in an atmosphere where gas is burnt. In a room where gas is badly burnt I am frequently conscious of organic matter, unconsumed carbon, which is very objectionable, where bad burners are used, and they are allowed to smoke.

By Mr. MITCHELL-HENRY: The value of the residual products of gas manufacture has of late very much increased, and the dividends of the gas companies have thereby been augmented. As to the relative economy of gas and the electric light on the item of fuel expended, it has, I believe, been stated that 3 lbs. of coal are required in order to generate power sufficient to make 1000 candles power of electric light, while it was necessary to consume 56 lbs. of coal in order to make the same light by gas. That is so, if we look simply at the amount of fuel put into the retorts; but it rather represents gas-making as a crude and wasteful manufacture, which I altogether decline to accept as a fair description of it. I may say that, of a ton of coal put into the retort, very nearly 14 cwt. is withdrawn as coke; and after we have used 25 per cent. of that for heating the retorts, making steam, and so forth, we have 10 cwt. for sale. Weight for weight, coke is rather more valuable than coal; but gas companies have to press their sales of coke in the winter, and therefore they do not realize more than half the price of the coke. Then, again, the two products that have market value are tar and ammonia. Taking 13s. 6d. as the price of coal delivered into our retort-houses, we receive for those products 10s. 4½d.; so that the net cost chargeable to the gas is 3s. 1½d. per ton; 56 lbs. for 3s. 1½d. comes to 1·85d. as the cost of the coal for making a 1000-candle light; and I have no hesitation whatever in taking 8 lbs. as a fair representation of the amount of fuel required in the engine for each horse power. The cost of that 8 lbs. of coal would be 0·9d.; so that the comparison would be as 2 to 1.

The CHAIRMAN: In obtaining the light from gas, you are probably aware that it is a very wasteful application of energy, as you only get a small portion of illuminating power out of a large amount of energy. If that is the case, in any competition in the future between gas and the electric light, would it not be to the interest of the gas companies to increase their illuminating power, and to decrease the heat energy which is lost just now, and which is an inconvenience to the public?

Witness: I am not sure that, for the same cost, an increase in the illuminating value of the gas would diminish that ratio.

If out of one cubic foot you get more light and less heat, would it not considerably diminish the inconvenience of heat to the public?—I should say that it would.

You have stated that the impurities in gas now are reduced very much to a minimum; but are you not aware that the impurities produced by the combustion of the gas are, mainly, not sulphurous acid, to which you chiefly referred, but the large amount of carbonic acid which is thrown into the atmosphere; and the more illuminating you can make the gas, so that you can burn smaller quantities, the less impurities you throw into the atmosphere?—That is so.

If the electric light has a future before it, perhaps gas has a future before it too, in relation to improvements of the gas supplied to towns?—I feel that that is so, and especially in the matter of the price of gas. May I say, in reference to the contamination of the atmosphere, that allowing that one gas light does cause the formation of as much carbonic acid as three individuals, it does not follow that in a public room the atmosphere would be contaminated by the gas to the extent of 3 to 1; because, say that 30 lights in a large room would be sufficient where 500 people were assembled, the proportion in such a case would be as, say, 80 per cent. on the part of the audience, and only 20 per cent. on the part of the gas.

Mr. *William Sugg*, examined by the CHAIRMAN.

I am a Gas Engineer, and have an establishment in Westminster, and another in Paris. I have had much experience in the manufacture of apparatus both for the measurement of gas and for testing its illuminating power. I have had business transactions with foreign countries as well as at home for gas-burners, and went, under the direction of The Gaslight and Coke Company to visit Paris on several occasions to investigate the electric light. I made a report to them upon what I had seen first of all in the Avenue de l'Opéra, and also in the Hippodrome and the Magasins du Louvre, and those places where the electric light was generally exhibited. I also had an opportunity of being present at the trials made before the Jury of the different electric lights which were shown in the Exhibition. There were several tried; the ones which made most impression upon me, and I think upon the Jury, were those of Mons. Jablochkoff, and the point-to-point carbons. The machines which drove the electric lights were those of the Alliance type, and they belonged to the Commissioner of Lighthouses in Paris. There were a pair of them, and in the trials that I saw, the two of them were put into operation, for the purpose of producing the light with the Jablochkoff candles. Four Jablochkoff candles were put side by side, close together. I considered that that was almost one candle, but the result of the four put together gave a naked light equal to nearly 2000 candles, or about 500 candles each. Then a trial was made with the point-to-point carbons with a Serrin regulator, and that gave a light nearly the same with only one of the Alliance machines working; and, as I estimated myself, about half the power was required to give the light that the others gave. They took two machines, and I estimated that they took twice the power. I may not be correct in that, for there were no means of ascertaining the power required; but the 2000 candles were given nearly by the same machine. When they were given by the point-to-point carbons, or by the Jablochkoff candles, it was nearly 2000 candles; and I noticed that it took two machines to do the one, and only one machine was required in the other case. The point-to-point carbon was a single light, and the other was a subdivision into four lights. The four carbons being placed close together in a space of not more than six inches, it seemed to me very much the same thing as the Rapieff light with four carbons, except that there were four resistances to overcome, and in the other case there was only one resistance. Then I visited the Avenue de l'Opéra, and I noticed particularly the electric light there. The light was very good, but there was a great deal of flickering, and the illuminating power of the lights was occasionally reduced, as far as I could estimate, to nearly one-half their value. At that time I could not find out exactly what was the illuminating power of the lights; but since then I have become acquainted with Mons. Leblanc and the gentlemen who tried these lights, and Mons. Leblanc gave me the result of the trials that they had made. According to these the amount of light given by the Jablochkoff light in a horizontal line is estimated to be 285 candles; but in a diagonal line to the ground it gave a light of only 114·95 candles; so that for the purpose of lighting the street the Jablochkoff candle might be estimated at 120 candles. The statement given by Mr. Deacon about 175 candles seems, by my own observation, and by the particulars of the experiments carried out by Mons. Leblanc, who is the Chief Gas Examiner of Paris, and well acquainted with photometry, to be too high an estimate. The light given in a horizontal line by the Jablochkoff candle was 285 candles. Now, in that case it does not fulfil what we should call the requirements for true photometry. In estimating lights in the photometer, we assume that the light is given equally in all directions. Take a Jablochkoff light, for example. If you take the upper half of the circle lighted by the Jablochkoff candle, that is greater than it is on the lower line, and if you do not give the light equally in all directions, then the photometrical value requires to be corrected for those results. If I applied reflectors to the light, I should estimate it in accordance with those reflectors; but taking the light as a measurement, what I should do with regard to the lighting of the Avenue de l'Opéra with gaslight would be, to estimate my gas photometrically as a light given in all directions; whereas, with the Jablochkoff light, I have to estimate a light given in a diagonal line less than that given in a horizontal line. Then upon that foundation I estimated what it would cost to light the Avenue de l'Opéra with gas, taking gas from the Paris Company. I found that there were 62 lamps lighted in the 1000 yards. Now I proposed to put in the place of each one of those an Argand burner in one of my new shaped lanterns. The burner that I should use would be between an 80 and a 200 candle size, and that would give a light of 120 candles. That I estimate to give a volume of light even greater, and in all directions, than that produced by the Jablochkoff candle. Taking into account the cost of the lanterns, fixing lamps and burners, and everything, I estimate it to be a capital amount of £1116. The interest on that at 5 per cent. I have estimated at £55 16s.; repairs and maintenance at 10 per cent., £111 12s.; gas for 4000 hours (not 2000 hours, half the night), 8,680,000 cubic feet at 3s. 4½d. per 1000 (which is the price of the gas to the Municipality of Paris—it is half the price to the private consumer), £1464 15s.; lighting, cleaning, and extinguishing, 20s. a year for each lamp (the usual charge being 16s.; but, in consequence of these lamps being larger, I estimate 20s.), £62; making altogether a total of £1694 3s., as the entire cost per annum of the 62 lamps of 120 candles each, lighted from sunset to sunrise; or 8s. 5¾d. for the 62 lamps—less than 1¾d. per lamp per hour. That is putting the burners on the posts now in use. The lamps are not placed, so far as I have been able to see, in any other way than just as they could be placed. There are certain difficulties in altering the position of the posts. I quite agree with Mr. Deacon, that if there were means of placing the lamps all at equal distances, and in the best possible position, the Avenue de l'Opéra might be more equably illuminated than it is at present; but with the spaces and streets intersecting, and one thing and another, I think that it would be almost impossible to alter the positions. If I were going to do such a thing as that in the great places, I should use burners of a more powerful description where the Boulevards cross, and in front of the Grand Opéra, and less powerful in a street where it is narrow. The cost of illumination would thus come to the same thing; but I should distribute my more powerful burners in the widest situations, and the less powerful burners in the narrowest situations. Mons. Lévy, who is one of the Committee charged with the examination of the electric light, and Mons. Leblanc, have given, in a report dated Dec. 28, 1878, a statement of the cost of the electric light in the Avenue de l'Opéra, and of the cost for all the power required for it, and they put it down at 7¼d. per hour with the motive power. Mons. Lévy says that the interest on capital and the cost of management, &c., are not counted; so that there is nothing reckoned but simply the cost of providing the light, and the cost of making the machines go and producing the light with the carbons. That, of course, would be a considerable amount. I estimate that it would cost about 40 times the amount to produce the same result with electricity; but that is not borne out by the experiment on the Thames Embankment, where the electric light is stated to cost about four times as much as gas. I can give you at once what will be the cost of lighting by this system, because it is parallel with the case of the Avenue de l'Opéra. Supposing that we had on the Thames Embankment these same lamps with 120-candle burners in them, we should be able to light the Embankment with gas, putting the lamps in the same position as the electric lights now are, at a capital expenditure of £360 for placing the lamps, burners, and everything in position. The working expenses would be as follows:—Gas for each burner, 120,000 cubic feet for 20 lamps, £420; lighting and extinguishing, £1 per lamp per annum, £20; interest on capital, at 4 per cent., £14 8s.; wear and tear, 10 per cent., £36; making a total of £490 8s., or 2s. 5¼d. for the 20 lamps per hour—rather over 1¼d. per hour for each lamp, which compares very nearly with the cost of lighting in the Avenue de l'Opéra. Therefore, by placing my lanterns on every one of the lamp-posts down the Thames Embankment, with 120-candle burners in them, the cost would be 1¼d., against 5d. for the electric light. The top part of my lantern is glazed with white glass to serve as a reflector, and the object of that reflector is to light all round the lamp-post. The burner itself is placed so that the whole of its flame is below the reflector. Therefore, for distant lighting, we have the direct rays. Nothing can be better or stronger than direct rays for distant lighting; and we have reflected rays to light the space round the lamp-posts. I dare say that you have remarked, in the ordinary lighting of the streets, that the darkest place is round the lamp-posts, and a great deal of the bad effect of street lighting arises from the shadows cast round the bottom of the column, which prevent both pedestrians and drivers from seeing the road clearly. My general result is that for equal lights gas can still hold its own, and, with judicious burners, will be more economical than the electric light.

The CHAIRMAN: You are perhaps aware that the Municipality of Paris gave two streets, one to be lighted by electric light, and the other to be lighted by gas, and that the result is very different from yours; the result

being that the electrically-lighted street was 50 per cent. less in cost than the gas-lighted street, but the burners were said to be bad?

Witness: It depends upon the estimate of the cost of the electric light, which it is impossible to get. The difference of opinion is so great that it is perfectly impossible; I have tried everything I can, but am not able to arrive at an accurate estimate of the cost of the electric light. Electricians appear to be particularly delicate about the capital question.

Of course, it depends a great deal upon whether the thing is in full progress, because all the managing expenses of a company which have only a few lights will be very heavy, when taken on the cost of each light?—Undoubtedly that makes a difference.

And where a gas company are lighting a whole district, the cost of the management spread over the whole district will be very greatly different from what it is where there are only 50 or 100 lamps in a locality?—If you will allow me to say so, with regard to the lighting of such a place as the Thames Embankment, for example, where there are a number of lights produced from one single source, it requires a certain number of attendants, and a certain amount of horse power to do it; so that if they had a great number of places to light all over London, I assume that they would have to reproduce their apparatus, machinery, and attendance for a certain number of lights, the same as they have now.

But they would divide their general expenses of management, directors fees, and secretaries salaries, and all those sort of things, over a much larger area, would they not?—They would.

Examination continued: My burners were those that were used in Waterloo Place. It is very difficult to say what is the reason why they have been abandoned. The Chartered Company were trying this experiment at their own expense, and probably they would have carried it on throughout the year, but they were directed by the Vestry to withdraw it. The lamps have since been nearly all sold. The Great Northern Railway Company have taken a quantity of them, and I believe the London, Brighton, and South Coast Company are going to take a further quantity for lighting up their stations. It was no question of failure, and the public generally approved of them very much indeed. The lighting of Waterloo Place previous to the new system of lighting was done by 43 lamps, each of which was provided with a burner consuming 2½ cubic feet of gas per hour, giving a light equal to 7 sperm candles. The cost of that lighting was 5½d. per hour for the whole 43 lamps. One of the lights is an example of very bad lighting—indeed, of wasteful and extravagant lighting. There is a lamp between the Athenæum and the United Service Clubs, which is 15 feet high from the ground, and it has two burners, giving a light of 7 candles, in it. The amount of light that reaches the ground is very small indeed. Of course, you see that, light diminishing as the square of the distance, there is not the ghost of a light getting to the ground; so that that light might as well be put out—it does nothing. The other lights all the way down the road, being at a height of 10 feet from the ground, do not give a sufficient illumination upon the ground. Supposing that you were to light all the way down Waterloo Place with illumination lamps, 3 feet apart, and fix them 10 feet high, it would represent the illumination previous to the new system of lighting. I was inventing my large-size burner before the electric light. I felt that the employment of gas in a larger burner would give better results, per cubic foot of gas consumed, than when it was employed in a smaller burner, and the result has justified my expectations. I may say that I was spurred on by witnessing the effect of the lighting of the Avenue de l'Opéra, and I saw at once that we could produce a light which would be able to give as good, and, in fact, I think a better light than electricity, and at a much less cost.

By Mr. PULESTON: In Waterloo Place the cost of the improved lamps was a little over twelve times the cost of the displaced ones. But the lighting was different altogether. The old lighting was effected by 45 burners, and the total amount of light was 315 candles; but the new lighting gave a light of 4800 candles. At present the electric light cannot anywhere be produced at a cost equal to that of the gas lighting on the Thames Embankment; light for light, the cost would be 1½d. against 5d.

By Mr. ARTHUR MOORE: In each of their Paris lights the Société Générale d'Electricité give a light of 115 candles; that is the estimate of Messrs. Leblanc and Lévy, and not mine. I estimate about 120 candles, and their estimate is about 115 candles by the diagonal line, and 170 to 180 horizontally.

Mr. PULESTON: So that, taking everything into consideration, I understand you to say that those beautiful lights, which are now discontinued, in Waterloo Place, could be produced at about one-third of the cost of the electric light?

Witness: At one-third of the lowest cost of the electric light.

By Mr. TALBOT: The lamps which contain my large burners are rather cooler than an ordinary street-lamp. That is owing to the ventilation from the top. The consumption of gas per hour for each of those burners is—in the 200-candle burner, 50 cubic feet per hour; in the 120-candle burner, 30 cubic feet per hour. An ordinary street-lamp consumes 5 cubic feet per hour if you take the City and the parish of Lambeth; but in most of the other parishes of London, I think, it is 4½ cubic feet per hour.

By Sir DAVID WEDDERBURN: The amount of light obtained from an electric centre is much greater in a horizontal direction than diagonally. This is not entirely due to the shadows cast by the various mechanical agents used for producing the light. All electric lights do not give light equally in all directions. If you take the point-to-point carbons, supposing that you place the two carbons one in front of the other, that gives a light very much stronger than the real light of the thing. It gives an unequal light in different directions, and the same when the voltaic arc is circuiting on the point of the carbon; on whichever side it is, it gives the greatest amount of light. In estimating the value of gas-burners, you must reckon that the same amount of light is given in every direction; and that is what photometry assumes. In making all our photometrical observations, we deal with a light which gives light equally in all directions; and a corresponding correction must be made in the case of the electric light when it is measured photometrically, so as to give the light which is given in all directions, and not in one direction only.

Sir DAVID WEDDERBURN: The fact that the greatest amount of light is given out in a horizontal direction—that is to say, parallel to the surface of the ground—must be due to the position of the carbons, so that by an alteration of their position these brilliant pencils of light could be directed in any given direction?

Witness: Yes. If the Jablochkoff candle were inverted, for example, then the horizontal rays would be thrown to the ground.

By Mr. MITCHELL-HENRY: The experiments in Waterloo Place originated in an offer from the Gas Company to the St. James's Vestry. I have no notion why it has been discontinued. One of the influential members of the Vestry told me that he thought there would be a great objection in the Vestry to these lights, because if they were allowed to be put up the Vestry might be compelled to increase their lighting in other streets.

By Mr. PULESTON: From what he said, I presume he meant that the Vestry did not want the people to get accustomed to the lights, otherwise they might be called upon by the inhabitants to continue them, and spread them all over their district. I have not heard whether any application was made to the Vestry to put more of the lamps in any other part of the parish.

Mr. PULESTON: I understand that that was the immediate cause of the position they took, an application having been made for extending the system; they saw that it was desirable to stop it?

Witness: I did not hear that; but that, perhaps, has a great deal to do with it. The lighting was discontinued without any reason being assigned.

SIXTH DAY.—FRIDAY, MAY 16.

(Members present: Dr. Lyon Playfair in the chair; Mr. Alfred Gaythorne-Hardy, Mr. Hardcastle, Mr. Mitchell-Henry, Lord Lindsay, Mr. Arthur Moore, Earl Percy, Mr. Puleston, Mr. Spencer-Stanhope, Mr. Christopher Talbot, and Sir David Wedderburn).

Mr. *George Livesey*, examined by the CHAIRMAN.

I am Engineer and Secretary to the South Metropolitan Gas Company. I have a strong opinion that gas companies should not be allowed, in the event of the introduction of electric lighting, to have anything to do with it. In the first place, the two systems of lighting are so totally distinct from each other, that the gas companies have nothing whatever, in the shape of plant or apparatus, that could be used for the supply of the electric light; secondly, if they did so, I believe that their attention would be, to some considerable extent, distracted from their proper business of supplying gas, and that both the gas interest and the public interest would thereby suffer. They would require a separate and distinct staff of managers and workmen, and I do not see, on the whole, that any good would result. I should see no objection to corporations which have the right to supply gas to their towns, supplying the electric light also, with due provision to protect the ratepayers against loss—that is to say, to prevent the rates being used for making needless and costly experiments. Corporations have the right to supply the public lights, and if they wish to supply those lights by electricity, or by oil, or by any other means, I see no objection to their doing so; but I do see an objection to public authorities, aided by the rates, being allowed to enter into competition with private enterprise.

The CHAIRMAN: But I am supposing a case in which there is no competition with private enterprise, such as the case of a corporation which has already the gas supply of a town?

Witness: Then it is merely a question between the corporation and the ratepayers. Corporations have hitherto taken the gas supply into their own hands, in most cases for the purpose of making a profit out of it; and if they can make a profit out of supplying the electric light, I do not see why they should not do it.

Examination continued: In the case of corporations having the supply of the electric light, the same contingency might certainly arise as might be apprehended if gas companies took charge of the electric light—that is to say, that it might be to their interest to promote the one light and not the other. It would, therefore, be possible that corporations who are making a large profit through gas might be the enemies of electric lighting. And the same with regard to gas companies. There is an incompatibility, and I cannot see how the two systems could be reconciled and worked under one management. As an engineer, I should admit that if the electric light is suitable as an illuminating agent, facilities for its introduction ought undoubtedly to be given. However, if privileges are granted by Parliament to any electric lighting company, I think it is only fair that those privileges should be accompanied by corresponding obligations. The gas companies have certain privileges, but they have obligations also.

The CHAIRMAN: Supposing that there are a number of associations intending to produce the electric light, the largest demand for it being, at the present moment, for lighting individual establishments or single halls, why should there be restrictions imposed when there is no monopoly?

Witness: There should be no restrictions whatever under those circumstances; they should be left perfectly free.

It is only when the electric light companies come into competition with gas companies that there would be a monopoly; as, for instance, for lighting public streets?—Yes; if the electric light companies were to seek parliamentary powers to lay wires in the streets, I imagine they would have a monopoly similar to that of the gas companies, because it would not be practicable to allow a number of companies to tear up the streets, just as it had been found impracticable to allow a number of gas companies to lay mains in the same streets.

You are aware that the breaking up of streets would be much less serious in the one case than in the other?—I am.

In the case of huge gas-mains being put down or taken up, the whole street is rendered impassable for traffic; but where a few electric wires were laid down the side of the street, the same difficulty would not be experienced, would it?—Not to so great an extent; but I think if you multiplied, or attempted to multiply the electric wires, you would find the streets very much incommoded.

That is on the supposition that the electric light may in the future be in some way competitive with gas?—Yes, the one with the other. For instance, some 20 years ago, in such a leading thoroughfare as the Strand, there were as many as seven or eight gas companies competing for the lighting, and each company would have a main on each side of the street; so that there were in some cases 15 or 16 mains in one street.

If that is likely to occur, it is clear that the electric light companies must come under some obligations to the public?—Yes, I should think so, if they have a monopoly.

Have you considered who in such a case should have the power to impose those obligations?—The obligations should correspond to some extent to the ones imposed upon gas companies; but from the nature of the case they must necessarily be different. Similar obligations or similar restrictions could not be imposed in both cases; but corresponding ones might be imposed. The nature of them, however, I am utterly unable to define.

By Lord LINDSAY: I do not say that the electric light is not calculated to be used for street lighting, but I do not think it is adaptable to the multitude of purposes for which gas is used. There are circumstances in which I think the electric light might be used. It is a question of cost. In certain cases, it would, I think, supply a want which gas does not supply—such, for instance, as the lighting of large areas. For example, supposing that you wished to light the goods yard of a railway station at night, you would be able to use the electric light in many ways, and gas could not compete with it except at very large cost. With regard to restrictions, I consider that with the electric light applied to public purposes, restrictions should be placed upon the companies similar to those which are imposed upon gas companies. These restrictions should be imposed, in my opinion, for the protection and security of the public interests. I think it is the universal practice with regard to gas companies, that a limit should be imposed by Parliament as to the price to be charged. The old system was that a maximum price was fixed, and beyond that the Company might not go. When they were enabled to make a larger profit than was sufficient to pay that dividend, the surplus was to go in reduction of the price of gas; but since 1875 a new principle has been introduced, which regulates the dividends that the companies

may pay by the price which they charge for gas. If a monopoly is granted to electric light companies, it should be accompanied by conditions which would compel them to give a certain amount of light for a certain amount of money. Then, on the question of photometry, the light would have to be of a certain standard quality, so that the public might know what they were buying. If the electric light were to come into pretty general use in the streets, it would practically have no effect at all upon our dividends, as regards street lighting. I do not by any means say that the public lighting is not valuable; I consider it is valuable. But it does not amount to more than 10 per cent. of the total lighting, or hardly so much.

The CHAIRMAN: Do you mean 10 per cent. of your profits, or 10 per cent. of the gross revenue?

Witness: Ten per cent. of the amount of gas consumed. If 1000 million cubic feet of gas are made, perhaps 100 millions of it, or something less, would be consumed in the public lights. In my own Company it is less. It amounts to about one year's normal increase; we increase at the rate of about 8 per cent. per annum, so that if all the public lights were taken from us to-morrow, there would be an immediate loss, but in twelve months time it would be recovered, and we should be making and selling as much gas as we do now.

By Lord LINDSAY: It would throw us back not more than a year. Supposing that there was this brilliant electric illumination in the streets, there is no doubt but that the eye of the public would be educated up to demand a more brilliant light from us. Practically speaking, we could not very well increase the illuminating power of our gas to any great extent. The amount of cannel is limited, and we are compelled to depend pretty well upon ordinary coal, which gives a light of about 16 candles.

By Mr. SPENCER-STANHOPE: I think that restrictions should, in the interest of the public, be placed upon corporations, if they undertake the use of the electric light, in order to protect the ratepayers from the waste of public money. Corporations should not be allowed, by the aid of the rates, to enter into competition with private enterprise; but that corporations may, if they please, light the public streets by electricity, I think, is unquestioned. I have read everything that I have come across on the subject of measuring the value of the electric light, and, as far as I can learn, it is a most difficult matter either to measure the electricity or to measure the light—the discrepancies are so great.

Lord LINDSAY: Have you ever taken into consideration the use of gas as a motive power? At present, of course, illuminating gas is not very well adapted, or, rather, it is not adapted, in its best form, for a motive power?

Witness: Certainly not.

If the electric light were to come into use, and a great impulse were thereby given to the use of the gas-engine, would you, as a gas engineer, think it desirable to make a new description of gas for the purpose of obtaining motive power?—It would not be desirable unless there were a very large demand for it. It would be necessary to construct independent plant at the gas-works, and not only that, but to lay independent mains all over the district; and I am afraid that, unless there were a very large demand indeed, it would not pay. It would pay better to sell the ordinary gas for the purpose.

But, in addition to the motive power, there is the heating apparatus, which is coming very largely into use. People are beginning to utilize gas for cooking purposes, are they not?—Yes. In my own district, since the electric light has been talked about, there has been a great impetus given to the use of gas for heating. Some gentlemen have fitted up their drawing-rooms and dining-rooms entirely with gas-fires; but it is terribly expensive in those cases, though in the case of bed-rooms it will do very well. If gas were wanted in any quantity for heating, of course the illuminating gas that we sell is not the best gas for the purpose, and a cheaper and better gas could be made.

Mr. *G. Fosbery Lyster*, examined by the CHAIRMAN.

I am Engineer-in-Chief of the Mersey Docks and Harbour Board at Liverpool. I am a Civil Engineer and a Member of the Institution of Civil Engineers. In my capacity as Engineer of the Mersey Docks, I have had the conduct of works in which a large amount of light was required. [Witness then described the various lights they used for the purpose of assisting at the operations carried on in the harbour during the low water, and which necessarily have to be proceeded with as often as not during the darkness.] I subsequently tried gas, and with great advantage; it assisted us very materially; but under certain conditions it was difficult to get the gas to the works. We had to lay down pipes across broken ground, and over foreshores of the river bank, and that was found exceedingly difficult; besides which it was costly. The difficulty of applying gas under the circumstances led me, some two years ago, to seriously consider the application of the electric light to assist in these operations; and I visited Paris to see how it was applied there. I was so fully possessed with the idea of the value of this light, that I purchased an engine of some 8-horse power, and two Gramme machines with Serrin lamps, which I applied to the works at Liverpool; and the light has proved of the utmost value in enabling us to carry on a very special class of work with facility, despatch, and economy. With the 8-horse power engine, each Serrin lamp gives a light of about 6000 candles, which is vastly in excess of anything we ever employed before; in fact, it is almost as bright as daylight. From the mode in which we are dependent on the tides, four hours is about the maximum we ever work at a time; so that we do not experience any difficulty from the necessity of changing the carbons. Those we use last about four hours. In December, 1877, I introduced the system with two lamps. I subsequently added three more with the same horse power. On the 14th of March last I wrote to the British Electric Lighting Company upon the subject. I said: "By means of these lights the work can now be carried on with accuracy, efficiency, and economy, and over a much larger area than under the previous system, which consisted of gas and two lamps, and which was extravagant, inconvenient, and in no way to be compared to the electric light. I may mention that we have no difficulty in keeping the machines in order, or in maintaining a brilliant and constantly steady light, and that this work is all managed by one of our own men, who has had no previous experience whatever of lighting by electricity." I have no doubt that the electric light may be made useful for special purposes, for which it may be peculiarly fitted. I think that it would be of very great value at our dock entrances, for instance. During the winter months large ships, ranging from 450 to 550 feet in length, and from 5000 to 6000 tons burden, come from America, and they wish to get into dock at night. If we had a system of electric lighting at high water, when the vessel began to enter, it would be of immense value to the trade of the port. I think also that the electric light might be of very great value in discharging ships. Large ships come in, as I said, at night, and they want to get rid of their cargo as quickly as possible, and under the best possible conditions. Under the present system there is but a very languid and feeble light given off by the ordinary ships lanterns. If we had an electric light that could illuminate the whole of the ship, and the whole of the sheds adjoining, I think it would be of very great value to the trade, and it would very much facilitate the operation of discharging. I certainly think it would be useful sometimes for ships themselves to have electric lights, in order to enable them to come through the fogs in a crowded river like the Mersey. I know that, at the present moment, it is not allowed; but within the Mersey I think it would indeed be an immense benefit. Of course I should not like to give my opinion as to the conditions at sea.

By Lord LINDSAY: The light is so immediately over the men's work that no shadows of any consequence are cast. In respect to our special description of work, gas could not at all compete with the electric light, which has been of enormous advantage to us.

By Mr. SPENCER-STANHOPE: When the vessels are unloading alongside the quay, if we could have such things as sunlights, or electric lights, that could be produced with economy and facility, and if the motive power were easy to get at, and so on, I believe it would be of immense advantage in that particular direction. The height at which we should place lights in the open air for dark works would be about 20 feet above the deck of the ship.

By Mr. TALBOT: In the use of these lights in our "tide-work," there is only one centre of illumination about 28 or 30 feet above the work; but if we have any difficulty in the way of shadows, we lower the light. There is no necessity for the use of reflectors.

Sir DAVID WEDDERBURN: You have described the successful use of the electric light under special conditions, where you require a very brilliant light over an isolated area for a very limited space of time. I suppose you would say that those are precisely the conditions which are most favourable to the adoption of the electric light?

Witness: Precisely; it seems to have been made for it.

Mr. *Samuel Hunter*, examined by the CHAIRMAN.

I am an Associate of the Institution of Civil Engineers, and was President of the Manchester District Institution of Gas Engineers. I am Engineer and Manager of the Salford Corporation Gas-Works, which are upon a large scale. The limits of our supply cover something like 40 square miles. We supply not only the borough of Salford, which includes the three townships of Pendleton, Broughton, and Salford, but we go a considerable distance outside the borough into the districts of various Local Authorities, including the Barton Local Board, the Swinton and Pendlebury Local Board, and the Little Hulton Local Board; and we border upon other districts as well, including the whole parish of Eccles, which is a very extensive parish. We have about 186 miles of main-pipes, and about 30,000 service-pipes to supply about 30,000 different consumers. We have 5871 public lamps. Our make of gas is 715,676,000 cubic feet, and we use about 73,000 tons of coal. The works have cost about £400,000, and the market value is, I should think, about £1,000,000. The Council have approved plans for the extension of the works, which is at present in progress. Part of it has been done at a cost of about £60,000, and we have still about £100,000 worth of work to do. The annual cost of management is about £89,000. That simply includes the working expenses, salaries, wages, &c. The total income is about £133,000. The difference between £133,000 and £89,000 means interest on capital, sinking-fund, depreciation allowances, and profit, which represents the other £44,000. We make an allowance to the Improvement Committee of £10,000 per annum, and whatever we have over and above that goes to improve the works. So that out of the £44,000, while we pay about £14,000 for interest, £6000 for sinking-fund, and £10,000 to the Improvement Committee for improvement purposes, we have £14,000 left which we apply to the good of our own establishment. Ours is one of the oldest gas-works managed by a local authority; it has been in the hands of the Local Authority something like 46 years. That was previously to the formation of the Corporation; it was managed then by the Commissioners. We have what I call a restricted monopoly; we work under restrictions imposed by Act of Parliament. There is greater liberality or a greater margin given to a corporation than to a gas company. We have no limit to our amount of profit, but we are bound with regard to the illuminating power and the price at which we sell the gas. All our profit goes back to the ratepayers in some form or other, either in the improvement of the works, in the improvement of the streets, or in the reduction of the price of gas. We charge now, within the borough, 3s. 5d. and 3s. 6d. per 1000 feet, and our illuminating power is, on the average, 20 candles. Assuming that electric lighting comes into operation, I am of opinion that the Corporation of Salford ought to have the power, within their own district, not to the exclusive monopoly of supplying light by electricity, but whenever it interferes with the public interest or inconvenience, so far especially as it interferes with the streets.

The CHAIRMAN: If you have complete command over the streets, although the wires might be carried overhead, and might not interfere with your streets, yet they might have to come down and pass through a small portion of street to light a particular house. Might not your Local Authority, having complete control over it, and desiring to supply gas to the house, stand in the way of the use of the electric light?

Witness: They might do such a thing, but I do not think they would.

Is it not their interest to have as much gas illumination as possible, in order to keep down the nominal price?—The works are simply a larger co-operative society, and the interests are mutual. I think such a proceeding would soon be corrected, inasmuch as the members of the Corporation are sent to the Council by the very ratepayers and people in whose interest you assume it would be to have the wires carried across the street.

But supposing that 5000 ratepayers are interested in the use of gas, and only 100 want the electric light, what chance would there be for the 100?—Very little chance.

Then in such a case as that the majority of the ratepayers might, if they desired it, being interested in the gas, altogether prevent the electric light being used, might they not?—They might do such a thing, but I do not think it is at all likely.

What you wish is, that corporations should have the power of putting a veto upon the application of the electric light, if it comes at all into contact with the streets; whether it be for public or private lighting purposes?—That is so.

You do not think that the principle of competition between trading companies in connection with new inventions is applicable to the supply of a town where the corporation already have charge of the illuminating agent?—No, I think not. In giving that reply, I assume that you contemplate giving a monopoly to either a company or a corporation, for the supply of the electric light under given restrictions. I think the ordinary rules of trading do not apply to such a case.

Examination continued: Corporations are slow in introducing an improvement where it is of a questionable character; but as soon as they are convinced of the advisability of doing so, I think they are quite as ready as private individuals. I have not any idea of the percentage of corporations that introduced tramways when they had the power to do so. I know the Salford Corporation introduced them about four years ago. I have heard that generally the power to corporations having lapsed under the Tramways Act, private companies had to come in and do what they had neglected to carry out. I think that possibly private enterprise is much more of a motive power than a corporate existence for the introduction of a new invention, especially when it comes into competition with another mode used by the corporation, and I would not prevent private enterprise in connection with the introduction of the electric light, so far as it did not interfere with the streets. I may say that I have

no apprehension that the electric light will be introduced to such a great extent for public lighting as to cause interference with the streets. I think that it would be perfectly right to give a private electric light company the power of appeal from a corporation to a neutral body like the Board of Trade, if any restrictions to its extension were found in practice to exist. In some cases a stated length of time is allowed under certain Acts of Parliament for taking gas into a particular locality; and in case of failure on the part of a company, the people of the locality have the right of appeal, of manufacturing gas themselves, or of starting a fresh company. I could give you instances to illustrate that. In a certain district, called the Clifton Local Board District, near Salford, the Radcliffe and Pilkington Gas Company had the exclusive right of the supply of gas; but provided that they failed to give a supply within, I think, six months after the passing of the Act, the residents had the right of starting a company of their own, or applying to Salford for a supply. It so happened that the Company vested with this power failed to give the supply; they invited us into the district, and we are at the present time supplying them. That is exactly the same principle as was applied to tramways; but it went a little further, and said, that supposing a company found it was resisted by a public authority, it had a right of appeal to the Board of Trade, and I think that is perfectly right. I think that some consideration ought to be given to a case like ours, where the Corporation have invested a large amount of the ratepayers money in the production of light; and that they should have a preference with regard to the application of any new invention, because we have not only the plea of vested interests, which can only be considered in a limited sense, but we are working under statutory powers, and have been compelled to give a supply; and so long as we act in conformity with the restrictions laid down by the Legislature, I think we ought to have the preference, if any monopoly of the supply of the electric light is to be given. We have many public halls and rooms where electric lighting is likely to be useful. It is not in use in any of our public halls at the present time, but it is in use in Salford for certain purposes. I know of one light which has been going on continuously—I think, for a year or two past. It is in a dye-house, and for such purposes it seems exceedingly suitable, enabling them to see the tints of colours at night as well as by day. They ignore the cost entirely, and wherever any firm is inclined to do that, no doubt the electric light is of great service. It is my impression that the electric light is not in a condition to supersede gas to any large extent—at any rate, at present. As an engineer, I should like to have the power of applying electricity under circumstances where it is desirable. Assuming that there is a desire on the part of the Legislature to give a monopoly to anybody, I think that the Corporation could carry out the duty far better than private individuals, or than any private firm or company. I do not think it is likely that the Legislature would be inclined to give a monopoly, except under restrictions where the using of streets is necessary; I think it would be right to impose those restrictions.

By Lord LINDSAY: The only bar to the use of the electric light for street illumination is the cost. I should not advocate its use at the present time, because the cost would be so excessive in a case like Salford, as compared with gas. We should have 186 miles of wire to lay down in order to light the whole of the streets. I have not gone practically into the working of the electric light. I have been compelled to take the statements of others, and then I have drawn my own conclusions. The expenditure in gas for lighting the streets of Salford at the present time bears no comparison to the cost of the electric light, even taking the most favourable statements that have been made before this Committee. I have thought the matter over in this way: At the present time I do not suppose that in Salford we spend more than, say, ½d. per hour for each 100 yards of street lighting for the ordinary streets; and where an abundance of light is given, it certainly does not cost more than ¾d. The electric light, even under the most favourable circumstances, would cost an immense deal more than that. I think Salford may be taken as a fair average town. Although we are nearer the coal-pits than some other towns, we do not realize anything approaching so much for our residual products. I think the net cost of gas of 16 candles illuminating power in London is quite as low as that of gas of 20 candles illuminating power in Salford. The variation in the price of our gas (3s. 5d. and 3s. 6d.) is through our making an allowance to large consumers.

Lord LINDSAY: With regard to the question of income from your gas supply, you said that a certain amount of money is placed to the improvement of your works. What sort of amount goes to that annually?

Witness: We are allowed by our Act to expend a sum not exceeding 3 per cent. on the works, and a larger sum on such things as meters, even up to 12 per cent. of the amount of our profits. We can allow up to £14,000. It is called a depreciation-fund, but it is really a reserve-fund.

Mr. SPENCER-STANHOPE: Supposing the electric light becomes a feasible thing for street lighting, you advocate that the Corporation should have a monopoly of supplying that light, but if any private individuals wished to supply themselves with the light in a place where it might occasion crossing a street with a wire, would you preclude them from doing so?

Witness: I would certainly forbid the crossing of a street, or the interference with a street in any way. I would give private individuals the same privileges which they have with regard to gas. People can make their own gas, but they must not interfere with the streets.

Lord LINDSAY: Would you object to their taking a wire from house to house across a street?

Witness: There would be no objection to their taking it over the street, but I would not allow them to disturb the pavement of the street.

Sir DAVID WEDDERBURN: We have received evidence that in London the amount of gas consumed for the lighting of streets is less than 10 per cent. of the total amount of gas consumed. Should you say that a similar percentage holds good for Salford?

Witness: Yes, in the streets alone it will not, I think, exceed 6 or 7 per cent.; and taking the large public buildings, and adding that to the 6 per cent., I think it will then not come to 10 per cent. of the whole consumption.

(To be continued.)

BURGESS HILL WATER COMPANY.—The ninth annual general meeting of this Company was held last Tuesday—Sir Walter Burrell, Bart., M.P., in the chair. The Directors report stated that the accounts for the year ending March 25 show a balance of £693 16s. 1d., from which they recommend dividends at the rate of 5 per cent. per annum on the original shares, and 4 per cent. per annum on the new shares, the whole free of income-tax. This leaves a balance of £23 6s. 1d. to be carried forward to the next year's account. There has been a large outlay on capital account during the year, and the water-mains have been extended to Ditchling and in the Burgess Hill district. The number of consumers steadily increases, being 562, against 454 as stated in the last year's report. Upon the motion of the Chairman, the report was adopted, and the retiring Diirectors (Messrs. T. W. Long, H. Frape, and G. Blaker) and Auditor (Mr. Sinnock) were re-appointed, Mr. Beale being appointed a second Auditor.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

THE PUBLIC LIGHTING IN ST. PANCRAS.

The annual report of Mr. G. Mackaness, the Chairman of the Lighting Committee of the St. Pancras Vestry, has just been presented to the Members of the Committee. In it he says: "The improved burner and lamp recently fixed in Regent Street and Queen Victoria Street and in other parts of the Metropolis, on the Sugg and Wigham principles, are certainly a great improvement as regards light given, but the additional light means, to a very large extent, simply the result of burning more gas, for those burners generally consume four or five times as much gas per hour as the ordinary lamps. The results on the rates of St. Pancras of the adoption of such a system throughout the parish would mean that the lighting-rate must be increased fourfold. It may be said that only the principal streets need be so lighted, but this is, I think, a fallacy. As a rule, the principal thoroughfares are business thoroughfares, and are well lighted by shops and other business lights, as well as public lamps, during the hours when most used, whereas nothing would be so dangerous to the safety of side streets as to make them by comparison darker. If the principal streets are illuminated to a degree beyond the necessities for lighting purposes, the inhabitants of the side streets would, moreover, object, and reasonably so.

"One important subject which has occupied your attention was the question of illuminating power of gas consequent on the reports made by the Examiner. This subject was well dealt with by the Examiner and the Vestry Clerk in the admirable report which they made upon the subject, and which fully justified the action taken by you and the Vestry. The Vestry authorized the best evidence to be obtained to justify the position they took on behalf of the St. Pancras consumers; and although there was, owing to the legal aspects of the question, no definite result, still the Vestry justified their action, and showed how necessary it was that the subject should receive the attention of the Metropolitan Board, the Gas Company, and of Parliament.

"The system of testing the meters *in situ* has now been continued for two years, and it was proposed that every third year the meters should be taken up and tested, but now I am inclined to ask you to reconsider this. It is somewhat doubtful whether such an extra expense as may arise therefrom is really necessary, especially at present, when you have under consideration the question of reducing the number of meters.

"As yet the Gas Referees have not decided upon your application to fix the ratio of lamps per meter higher than 20, as proposed by the Company; but even if the Committee resolve to fall back upon the offer of the Company, and consent to 1 in 20 instead of 1 in 12, that alone will be an important alteration, and will reduce the cost of maintenance, though it will also necessitate a re-arrangement. This subject, however, is not sufficiently ripe for me to treat upon too fully at present. I feel satisfied that the suggestions made upon the statistics prepared by the Clerk of the department are sure to result, sooner or later, in a considerable saving."

The following is Dr. Whitmore's report on the illuminating power, pressure, and quality of the gas supplied by The Gaslight and Coke Company to the parish of Marylebone during April:—

APRIL.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogen
	*Mean of 22 Obsers.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Common gas . . .	16·87	17·30	16·01	38·01	13·00	12·30	0·35	No trace
Cannel gas	22·07	23·60	20·11	20·15	13·12	11·06	0 13	No trace

Mean of daily readings of barometer . . . 29·49
" " " thermometer . . . 62·00

* Each observation consists of ten readings of the photometer, at intervals of one minute.

The mean illuminating power of the common gas was equal to 16·87 sperm candles; it ranged between 16·01 and 17·30 candles; 9 times it exceeded 17 candles. The cannel gas, supplied only from the Pimlico works, gave a mean light equal to that of 22·07 sperm candles. The range was between 20·11 and 23·60 candles; on six occasions it was 3 candles in excess of the legal standard. In the common gas the mean quantity of sulphur found in 100 cubic feet was 12·30 grains; and in the cannel gas 11·06 grains. Practically there was no ammonia, and no trace of sulphuretted hydrogen was found in either of the gases. The pressure in both was satisfactory.

METROPOLIS WATER SUPPLY.

Lieut.-Col. Bolton reports that the state of the water in the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was good from the 1st of April to the 7th; it then became turbid, and remained in a bad condition during the rest of the month. The highest flood state of the river at West Molesey during the month was 2 ft. 11 in., and the lowest 1 ft. 1 in. above the summer level, the rainfall at this place being 2·75 inches. The water in the River Lea was indifferent during the early part of March.

The following is Dr. Whitmore's report on the composition of the water supplied to Marylebone during April:—

APRIL.	In Grains, per Gallon.							In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlorine.	Equal to Chloride of Sodium	Nitrogen as Nitrates and Nitrites.	Oxygen required for Oxidizable Matter.	Estimated Organic Matter.	Free Ammonia.	Albuminoid Ammonia.	Hardness.	Hardness after Boiling Fifteen Minutes.
West Middlesex	22·60	0·90	1·20	1·97	·107	·064	·512	0·01	0·07	15·4	4·8
Grand Junction	20·80	0·90	1·18	1·94	·124	·084	·672	0·01	0·09	14·3	4·6
River Thames at Hampton .	21·80	1·25	1·22	2·01	·122	·108	·864	0·01	0·19	14·7	4·7

* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, *minus* such loss, consisted chiefly of carbonate of lime, with small quantities of other equally harmless salts.

Temperature of West Middlesex water when drawn from the main 44° Fahr.
Temperature of water when taken from the Thames . . . . . 51° Fahr.

The water as drawn from the mains of both Companies was clear and well filtered; that taken from the river was somewhat turbid.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Annual Meeting of the above Company was held at the London Offices, Great Winchester Street, on Thursday, the 22nd inst.—D. T. Evans, Esq., in the chair.

The Secretary (Mr. W. Marshall) having read the notice convening the meeting, the following report and statement of accounts were taken as read:—

Your Directors have pleasure in submitting to the Shareholders a statement of accounts, duly audited, for the half year ending the 31st of December last.

There has been an increase in the gas and meter rental, and a decrease in the cost of production.

The sales of residual products show a slight increase as compared with the corresponding half year of 1877, and a considerable increase as compared with those of the last half year.

Owing to the continued adverse state of the exchanges, the loss to the Company has been very severe, amounting during the half year to £2281 1s. 4d., which, with the debit standing at exchange equalization account in June £1283 0s. 3d., makes £3564 1s. 7d. loss to be provided for. Of this the Directors have charged £2000 to profit and loss account, and £1564 1s. 7d. to the reserve-fund for the equalization of dividends, thus writing off the whole loss.

The amount at the credit of profit and loss account for the half year is £9590 15s. 8d., which, with the balance brought forward, makes £9835 10s. 9d.; and, after providing for the debenture interest, the balance available for appropriation is £9643 4s. 10d.; out of which your Directors recommend a dividend of 4 per cent. (making 7¼ per cent. for the year), free of income-tax. This will absorb £9600, and leave £43 4s. 10d. to be carried forward to the credit of next half year.

The Directors who retire by rotation are Daniel Thomas Evans and William Fletcher Gordon, who, being eligible, offer themselves for re-election.

The Auditors, Edward George Bradley and Robert King, retire from office, and, being eligible, offer themselves for re-election.

The dividend will be payable on and after the 3rd of June next.

General Balance, Dec. 31, 1878.

Dr.				Cr.			
Capital authorized—(50,000 shares, at £5 each—£250,000.)				Construction account		£203,287	17 1
40,000 shares, £5 paid	£200,000	0	0	Retort account		899	0 5
10,000 shares, £4 paid	40,000	0	0	Services account		119	14 7
	£240,000	0	0	Goods in transit		116	5 9
Debentures*	5,100	0	0	Stocks, viz.—			
Amount owing by the Company	1,415	2	10	Chandeliers, brackets, &c.	4,748	10	10
Reserve-fund (equalization dividend account) £5,000 0 0				Brass and iron goods, &c.	5,336	4	8
Written off for loss on exchange 1,564 1 7				Mains, services, and tools	1,870	12	3
	3,435	18	5	Meters	2,890	7	0
Reserve-fund (for depreciation of plant, &c.) £3,410 12 10				Coal	18,747	2	0
Written off 95 1 3				Amount owing to the Company	5,190	9	9
	3,315	11	7	Cash at Bankers, on deposit, and in hand, viz.—			
Insurance-fund	1,826	8	7	In Bombay £16,037 0 5			
Passage-fund	243	14	2	In London 736 15 8			
Balance to general revenue account	9,643	4	10	Bank bills in hand 5,000 0 0			
					21,773	16	1
	£264,980	0	5		£264,980	0	5

* £4100 of these debentures have since been paid off.

Profit and Loss Account.

Coal carbonized	£7,352	17	3	Gas and meter rental	£19,867	7 9
Wages	1,244	7	4	Coke, tar, fittings, &c.	3,766	18 6
Purifying	12	0	0	Interest	63	15 10
Maintenance of retorts	100	0	0			
Trade and general charges	694	5	0			
Salaries and Collectors commission	1,607	17	9			
Rents, rates, and taxes	426	11	1			
Directors and Auditors remuneration	626	5	0			
Bad debts	18	7	2			
Law charges	24	15	10			
Exchange ditto	2,000	0	0			
Balance	9,590	15	8			
	£23,698	2	1		£23,698	2 1

General Revenue Account.

Interest on debentures	£192	5	11	Balance, June 30, 1878	£8,644	15 1
Balance carried down	9,643	4	10	Less dividend paid Jan. 1, 1879	8,400	0 0
					£244	15 1
				Balance for half year ending Dec. 31, 1878	9,590	15 8
	£9,835	10	9		£9,835	10 9
				Balance for appropriation	£9,643	4 10

The Chairman, in moving the adoption of the report, said: Gentlemen, the report and statement of accounts, which have been circulated as usual, set forth so fully and justly the state of the Company, that I have only to supplement them by a few remarks, which I hope may be of interest to you. It will be observed that we have an increase in the gas and meter rental, and a decrease in the cost of production. Now, though the increase in the gas and meter rental is small, and the decrease in the cost of production is not great, still they are satisfactory features when you consider the state of trade in Bombay; for the depression that has affected the whole of the mercantile world is felt very keenly there. The sales of the residual products show a slight increase as compared with the corresponding half year of 1877, and a similar increase as compared with the last half year; and that is satisfactory. The gas sold during the year 1878 was 38,998,800 cubic feet, as compared with 38,797,300 cubic feet in 1877, showing an increase in gas sold of 201,500 cubic feet. That is not very large; but it is satisfactory so far. The leakage, which has sometimes been excessive, has been very much reduced; it has been only 6 per cent. on the make of gas during the half year of 1878, as against 7½ in the corresponding half year of 1877, which is so far satisfactory. There were 176 tons less of coal carbonized in the December half of the year 1878, as compared with the quantity carbonized in 1877. The cost was £1 14s. 7½d. per ton in December of the half year now under review, as against £1 15s. 3d. in the same half year of 1877, showing a difference of nearly eightpence per ton. That is in our favour. We have an ample stock of coal at present. At the end of the year we had 10,828 tons, which is more than 15 months consumption of coal. We shall have to replenish our stock, and we hope to do so at some reduction on the present prices. We shall be shipping chiefly from Australia, and shall probably send some from this side; but our proceedings in this particular matter will be guided by circumstances. We now come to the most serious drawback we have encountered—the loss on exchange. During the twelve months our loss on exchange has been £6064 1s. 7d., or nearly at the rate of 2½ per cent. on the dividend. Instead of dividing 7½ per cent., we might, but for this, have divided 10 per cent. Our remittances were £39,000, and they came at 1s. 8¾d. per rupee. In July, 1876, the exchange was 1s. 6¼d. per rupee, and the lowest rate at which we have brought money over during the year was 1s. 8 1/16d. The cause of the depreciation is not far to seek. You will remember the Indian Government here have to draw bills on India to carry on the India Office affairs, and to pay the pensions of military and civil servants and other matters, to the extent of £17,000,000 a year. Now, their contract here is to pay that money in gold; but, inasmuch as the revenues of India are collected in silver, they have to bring their money over from the other side in silver; consequently, measured by the difference in value of the depreciated silver as compared with the gold they have to pay here, the loss for some four years past has been equal to 3½ millions of money, which is more than half the entire interest of the public debt of India. This has had a very disastrous effect in the past; although I think there are features more assuring before us. There is to be a loan of £10,000,000 raised in this country, which will reduce the necessity for the Indian drawings by more than one-half. There are £2,000,000 to be lent to the Indian Government also without interest. There was a very important telegram yesterday in the papers, stating that the German Chancellor, Prince Bismarck, has set his face against the further sales of silver. If that be so, it will undoubtedly raise the value of silver in this country. The half million of India bills that was allotted yesterday was allotted at a quarter per cent. premium; and I will mention another circumstance that, if it be true, will tell in our favour, and increase the value of silver—namely, the failure of the silk crop in Italy and the South of France. If that be so, it will very materially affect China and India, and there will be very much more silver required for the silk that will come thence. Cotton also, I may add, has advanced 30 per cent. So much for the state of exchange, and the hope that we have that it will be improved. With reference to our debentures, you remember that we borrowed £20,000 on them. On the 1st of January this year they were all paid off excepting one of £1000. That we have renewed for six months, at a reduced rate of interest, and the 28th of next month will see us entirely relieved of the burden of £20,000 of debentures and the £1200 a year interest which for some time we paid thereon.

A Shareholder: They have been paid out of revenue?

The Chairman: No. I will read some paragraphs from a letter received this month from Mr. Scott, our Manager in Bombay. It is dated the 21st of April. He says of the consumption of gas, speaking of the first three months of the present year—I have been dealing hitherto with the six months ending December last—"the actual consumption of gas by permanent private consumers shows an increase of over 100,000 cubic feet in the three months. During the year we have increased the number of private consumers by 115. Bombay during the past four years has passed through the most trying times. For four years the crops in this Presidency have failed, and the whole or a great portion of the effects of this long famine appear to have culminated in the last few months. If we have a good season this year, we have great hopes that things will quickly improve. The new docks will be opened in November next, and that is expected to do much to improve trade in Bombay. Some few days ago I sent round canvassers to try and get customers; but the dealers told me that they had to eat their food without salt." This is the native expression for extreme poverty. "I have great hopes that the worst is now over, and I think I see indications that such is the case; but everything depends upon the coming monsoon. One feature in the Company's affairs is good. Last year at this time we had a stock of 1580 tons of coke; to-day we have not a ton in hand at five o'clock." I hope that that letter will be reassuring to you. There is not much of interest in the accounts. I will go through them elaborately if you wish; but I can answer any questions the Shareholders may ask. As to the condition of our plant and works in Bombay, all that is very satisfactory, and due provision is continually being made for keeping them in a perfect state of completeness and efficiency. We shall shortly, I repeat, be putting in coal. It is gradually rising in price in Bombay, and that will help us in the price of our residual products, the chief of which is, of course, coke. There are, in the letter read to you, some indications of the revival of trade, and I think we may reasonably look forward with confidence to the future. We shall not do very brilliantly this year; but I think we shall be able to maintain the dividend. I shall be happy to answer any questions that may be put.

Major Suart seconded the motion.

Mr. Lovejoy said he observed two items on the debtor side of the general balance account. One was, "reserve-fund (equalization dividend account), £5000;" and lower down there was the item, "reserve-fund (for depreciation of plant, &c.), £3410 12s. 10d." This he did not quite understand, because he had always thought that the reserve-fund was one that was kept by itself. He wished to know the actual reserve-fund that the Company possessed.

The Chairman said that the reserve-fund was double in its nature, as explained in the accounts. There had been a pressure put upon the Directors so to express it, and he thought it was Mr. Penny who put the pressure on.

Mr. H. P. Stephenson said the thing was very simple. There was one reserve-fund, and Mr. Penny had very properly suggested that that fund should not be made use of for the equalization of dividend and the depreciation of plant, and the Directors had simply carried out the suggestion. In June, 1878, the sum had been divided, so that it did not appear before the Shareholders for the first time.

Mr. Lovejoy said his reason for asking the question was that he did not entertain the principle adopted by many trading companies of not keeping their reserve intact. It was made a sort of floating scale to suit certain proceedings in the company which ought not to be, and he was going to ask whether the fund was not kept separate and was not an accumulating fund from which something was obtained, however small. He thought the reserve-fund ought to be kept intact, and not to be worked in with the capital of the Company.

Major Suart said the reserve-fund was not an invested fund. The surplus money was more than the amount of both funds put together. There was at the present time £10,000 invested in the bank at Bombay, and that sum yielded an interest of 5 per cent.

Mr. Northover said he apprehended that if the Company had not this money, the Directors would be obliged to increase the debentures; so that it would amount to the same thing.

The Chairman said that the question had been discussed five or six times over in years past, and it had been the general opinion at the meetings that the fund should be utilized for the purposes of their trade.

Mr. Penny said that it had been at his suggestion that the "reserve-fund for equalizing dividends" and the "fund for depreciation of plant" had been separated. Those funds were formerly mixed up together, and this, in his opinion, was an incorrect method of dealing with them. He was only desirous that the reserve-fund should be used for its legitimate purpose, and that the other fund should stand by itself. In this particular case the reserve was made to do its own work. There had been a large loss by exchange, and if the Company had to suffer diminution in their revenue, the reserve-fund which had been appropriated for the express purpose of equalizing dividends had been used for its legitimate purpose. If the Company continued to lose by exchange at the progressive rate that had lately been experienced, there was no doubt that

the reserve-fund would soon vanish, and the Directors would have to consider the course they should take. Either less dividends would have to be paid, or the revenues would have to be increased, if the same dividends were to be received that the Shareholders had been in the habit of receiving. Whether the money standing to the credit of reserve was invested, or whether it was used for the purposes of the Company, thereby obviating the necessity for obtaining money from outside, he thought, as far as the Shareholders were concerned, was of very little consequence. He believed that the course adopted by the Directors was the proper one. He was fully cognizant of the course adopted by other companies; and if the reserve-fund were never to be touched he did not see the object of putting it away. It would have to be used for some purpose or another some day. In gas companies it had been used for the purpose of equalizing the dividends. It had been so used in their own case, and probably it would be so utilized again. If the dividend diminished, the question must be asked whether the price of gas should not be increased, so that there would be a reasonable reserve in the case of anything that might happen. The question of exchange was a very serious one. The Chairman had made a reassuring statement as to what would happen in the future. The proposed Government loan was only a question for one year. It might tide over this year; but it would simply add to the burdens of future years, and increase the amount that would have to be remitted from India in the future. He wished to ask the Chairman whether there was anything in the agreement with the Local Authorities that would enable the Shareholders to be recouped for some of the loss they were suffering day after day. He was connected with some South American Gas Companies, and there was a stipulation in the concession that they should be paid for the public lighting at a fixed rate of exchange. For instance, the exchange now in Brazil was 21, and was fixed in the concession at 27. The amount due for public lighting was therefore calculated at that rate of exchange, and that Company, unlike the Bombay Company, suffered no loss whatever. He did not say that the time had yet come when these things would have to be considered in connection with this Company; but it was a very serious matter if they were pinned down to receive their money in rupees, which, instead of being worth 1s. 10½d., or whatever the proper exchange should be, were worth only 1s. 6d. The time would come when the price of the article sold would have to be increased, unless the consumption and the profit increased. What he meant was this: In the ordinary course of a company's progress they were enabled to reduce the price of gas. It was quite clear that in the present state of things this could not be done; but if by the progress of the Company the Directors could go on and keep the cart upon its wheels, the public in Bombay would simply have to wait longer for that diminution in the price of gas, which a larger consumption would fairly entitle them to. He thought the statement made by the Chairman was, on the whole, very satisfactory. The increase in the business was no doubt small; but it was gratifying to find that it was an increase, and not a decrease.

Mr. NORTHOVER said it was well known that in the other companies where there was a reserve, there was no difficulty in showing a respectable dividend of 10 per cent. Their powers of paying it were, however, limited. He would certainly object to the calling for more debentures if there were means at the disposal of the Directors that would enable them to do without it. He could not quite share in the opinion of the Chairman as to the matter of exchange. He (Mr. Northover) was afraid that there would not be a better exchange for some time to come. The exchange received that day was 1s. 7¼d., and there was a large amount to lose. One of the speakers had referred to the probability of there being less discount in future; but he (Mr. Northover) thought that some people were inclined to look into the future more than was necessary. The reserve-fund had been established from the earnings of previous years for the purpose of equalizing the dividend, and that, he thought, was its legitimate use. The silk crop had been alluded to, and he was interested in that question. There was, however, he thought, as much silk in the country as would provide for a year and a half's consumption. The silk trade was worse now than it had been for the last 30 years; 1847 having been the worst year. Referring to the electric light question, he said that if the evidence was read which was given by scientific men and others within the last few days in a Committee of the House of Commons, it would be seen that the subject was being thoroughly ventilated. There was no difficulty on the part of these electric companies in paying a dividend, because it was a new thing, and they received a lot of money for selling their carbons and patent rights. In Paris he had been told that there were only 500 lights and 250 in the provinces, and in other countries 800; but what was that compared with gas? He did not deny that there was a use for the electric light, but he thought the shareholders in gas companies might certainly now look with some curiosity to what would come out of the Committee; but there was no necessity for them to be anxious to get rid of their shares. The Jablochkoff was the lamp that had been most largely used; but Mr. Shoolbred, who had been using it in Tottenham Court Road, said he paid as much for gas as ever. It was well known that the leading journal had been adverse to all gas companies; but not long since it showed, in concert with other papers, that there was not that antipathy to gas that there formerly was. One of the most important witnesses had said, in answer to the Chairman of the Committee which had been referred to, "I cannot take upon myself to say that every advantage belongs to the electric light," and he said this after he had been extolling the advantage of that light.

Mr. WILDE asked what was paid for the coal, what quantity of gas was obtained from it, and how many tons were consumed in the course of the year.

The CHAIRMAN said he had stated that the price paid for coal in Bombay was £1 14s. 7½d. per ton, against £1 15s. 3d., which was paid a short time previously. The coal used was Australian and English; but, as a general rule, Australian. There were three or four Australian descriptions, which were of excellent quality. A larger amount of gas was obtained from the Australian than from the English coal. It was larger and more compact, but the residual products were not equal to those derived from the English, and the coke was not so good; so that what was obtained in one way was lost in another. The number of cubic feet per ton, on an average, derived from the coal was about 10,000.

Mr. WILDE thought that that was very good work. He also thought that the question of exchange was a very serious one, and he did not think the rate was likely soon to change. He would be much pleased if the dividend were rather less than it was. He wished to know if there was much difficulty in disposing of the coke.

The CHAIRMAN said there was not. He was afraid, however, that there had been some impolicy on the part of those on the other side in increasing the stock of coke, in the hope that it would go up in price; but there was not now any in the yard—it was sold as it was made.

In answer to a question by Mr. WILDE, as to how the debentures were paid off,

Mr. STEPHENSON said they had been paid out of the general assets. The revenue had not borne any portion of it at all.

Captain REINECKER asked if the reserve-fund had been instituted for recouping the capital of the Company.

Mr. STEPHENSON replied that it had not.

Captain REINECKER asked whether the amount owing to the Company on the credit side of the account was a net estimate of the amount owing.

The CHAIRMAN said that the bad debts for the half year amounted to £18 7s. 2d.

Captain REINECKER said that that was very satisfactory; but he suggested that it would be better to enter it as "Trade creditors," instead of an amount owing to the Company.

The CHAIRMAN, in reply to Mr. Penny's question as to the contract with the Municipality, stated that under the contract with that body the Company were bound to supply them with gas at about 80 rupees per lamp per annum, and that was a fixed charge. As regarded the price to private consumers, if the dividend were to be maintained, it might be that there would be occasion to raise the price, but he should not like this to be done if it could be avoided. There was no likelihood of fresh debentures having to be raised. As to the introduction of electric lighting in Bombay, he would read a short letter from the Manager there, in reply to a communication he had personally addressed to him. When the report of Lieut.-Col. Haywood was made to the Commissioners of Sewers of the City of London, as to the effect of the electric light upon the Holborn Viaduct, it was very satisfactory to all persons interested in gas affairs, because it showed that the light cost about seven times as much as gas. The Chairman then read the letter received from Mr. Scott, and concluded with the expression of his opinion that if upon no other grounds than the large expense, there was nothing to fear from the introduction of the electric light in Bombay.

A SHAREHOLDER asked the reason why there was such a large quantity of coal, amounting in value to £18,000, in store at Bombay. It was well known that coal was very much injured by exposure to the atmosphere, and therefore depreciated in value. He thought that a six months supply was quite sufficient.

Mr. STEPHENSON said that the policy of the Board had been to buy in a large stock of coal when it was low in price, and he pointed to the fact that by such a policy the Company had been carried through the whole of the coal panic without any diminution in dividend.

The motion for the adoption of the report was then put, and carried unanimously.

The retiring Directors—Mr. D. T. Evans and Major W. F. Gordon—were re-elected, as were also the retiring Auditors—Messrs. E. G. Bradley and R. King.

General RIGBY proposed a vote of thanks to the Chairman.

Mr. PENNY, in seconding the motion, said he did so most cordially, because the concern was well worked, and the dividends were honestly earned. He, therefore, felt he had a property that would stand by him.

The motion was carried by acclamation.

The CHAIRMAN, in returning thanks, said he hoped that he and his co-Directors would continue to deserve the confidence of the Shareholders. In alluding to the management out in Bombay, it had not, perhaps, been altogether satisfactory to some of them, but it certainly met with his own approval, and, he might say, with the general approval of the Board. In Mr. Scott, the Manager in Bombay, the Company had a very hardworking, energetic, and zealous servant.

Mr. PENNY, in complimentary terms, then formally moved a vote of thanks to Mr. Scott, which was seconded by Mr. NORTHOVER and carried.

A vote of thanks was also passed to the Secretary, who suitably acknowledged it, and the proceedings terminated.

MAURITIUS GAS COMPANY, LIMITED.

The Ordinary General Meeting of Shareholders was held at the London Offices of the Company, 29, Great St. Helen's, on Monday, the 12th inst.—W. WHITE, Esq., in the chair.

The SECRETARY (Mr. A. Hersee) read the following report:—

The Directors submit herewith a statement of accounts for the past year, and report with regret that the operations of the Company during the above period have not resulted favourably. Instead of the expected increase of business, there has been a diminution in the revenue from gas as well as in the receipts for residual products sold, which may be mainly attributable to the protracted depression of trade.

The number of private lights fitted shows a small increase, and this, it is hoped, may eventually tend to an extended consumption of gas. No disposition is evinced by the Municipality towards providing additional street-lamps (one extra lamp only having been erected since last report), and further economy has been practised by the Authorities in the use of gas for public purposes.

The coal used during the year was chiefly supplied from England, and was delivered at reasonable rates of cost and freight. Australian coal continues considerably higher in price than English coal. This is much to be regretted, as it does not deteriorate by storeage to nearly the same extent as coal from this side.

Exchange has again proved a serious burden, and completely disappointed the fair anticipations of improvement. It is still in a very unsatisfactory condition, and no conclusions as to its future can be safely arrived at.

The CHAIRMAN said: Gentlemen, I have to express the sincere regret of the Directors that they are not able to present a satisfactory statement concerning the progress of the Company. At the last annual meeting there were reasonable grounds for hoping that matters would improve. The private consumption of gas in 1877 had increased over the previous year, and it was hoped that this increase would continue, as exchange seemed likely to mend, and coal was not expected to advance; but these anticipations have been doomed to great disappointment. The private rental fell off to the extent of £116 for no accountable reason, except that a few consumers had removed to the country, and that trade was dull in Mauritius, as elsewhere. The rental from Government buildings shows a further decline of £42 from that of the previous year, and is the result of orders of economy impressed by the Government upon their officers. The working was not so good as in the previous year. More coal was used, and less gas accounted for, owing to extra leakage and inadequate yield of gas from the coal. The Manager asserts that English coal deteriorates by storeage in hot climates, and that he did the best he could with the coal, which may be true; but the Directors were careful to send a description—namely, New Pelton—which is well known for its excellence, and is shipped in large quantities to the Mediterranean and other foreign places, and they are certainly surprised that it should not turn out well in Mauritius. It is a great pity that Australian coal is not available to us at reasonable rates, for it seldom gets heated in store. The price is so much in excess of English, that we are driven to run some risk in the matter. The Directors are trying to obtain Australian coal on reasonable terms, failing which they must still ship English coal of an approved description. A larger quantity of coke was made and sold, but lower prices were realized, so that the receipts were not increased. The Company at one time had a considerable stock of coke, which it will be easily understood deteriorated greatly in value by storeage, and much of it became breeze; but this is now reduced to moderate proportions, and is expected to be cleared off soon. The sales of tar were less than in 1877, but the rates obtained were satisfactory. The Directors are of opinion that the demand for this product ought to greatly exceed our available supply. The report informs you that a new Manager has been appointed, and the Directors believe that improved working will be the consequence. Mr. Darney, the gentleman appointed, is highly recommended to us, and he promises to use his best energies in our behalf. His remuneration has been so arranged that it is

to his interest to increase the revenue and diminish the expenditure. The future must prove whether he will do well for the Company, but his testimonials and antecedents justify the most favourable anticipations. For the last few years the Company have been suffering greatly from loss of revenue, owing to the departure to country residences of many of the former well-to-do inhabitants of the town, the railway affording easy facilities for this purpose. Some have gone to Beau Bassin and Rose Hill, about seven or eight miles from Port Louis; but the greater number have removed to Curepipe, which is distant about 15 miles. The idea has lately occurred to the Local Committee and Manager that it might be practicable to convey gas to the above places from the works in Port Louis, and thereby regain the lost customers. It remains to be proved whether this can be done profitably, or whether it will answer our purpose to set up small auxiliary establishments. The matter has only recently been set on foot, but certain preliminary data have come to hand by this last mail which justify a thorough investigation of the subject, and the new Manager has been instructed to make the fullest inquiries as to the practicability of the scheme, and report the result. It seems unusual to supply gas at a distance of 15 miles from the manufactory, though it is not at all impossible, for gas is propelled as far in London every day; but in our case the gas would travel by natural laws, for the ground rises gradually to a height of 737 feet above sea level at Beau Bassin, 923 feet at Rose Hill, and 1800 feet at Curepipe. The question resolves itself into the cost of gasholders and pipes, and the amount of profit on the outlay which may be relied on. As before mentioned, the subject is at present in an elementary stage, and no definite statement can now be made; moreover, it is of great importance that the new Manager should see for himself, and give us his opinion. In Mauritius, Mr. Mann, the assistant to the Surveyor-General, has been consulted, and he has furnished a report encouraging the carrying out of the proposed extension. The Government have promised to use gas if the price be moderate, and many private individuals have done the same; but the Directors will not enter upon the work, and incur an outlay of probably £20,000, without distinct engagements that such a minimum quantity of gas will be consumed as will afford a fair profit from the commencement. A considerable time must necessarily elapse before this question assumes a definite shape, but if it proves feasible, it may help to restore our lost prosperity. The Directors had contemplated proposing a reduction in the nominal value of the shares, but consider it better to defer this measure, pending a settlement of this proposed extension. Exchange is a subject which has unfortunately become of chronic importance, and it would indeed gratify the Directors if they could discover any solid grounds for expecting an early improvement; but matters are rather worse than better, and we shall undoubtedly suffer heavily in the current year. The amount at the credit of revenue account is sufficient for the payment of a little better dividend, but the unfortunate hurricanes which lately visited the island have damaged our property, rendering it advisable to provide for the exceptional expenses which must follow. The gales were very severe, and injured the crown of the old gasholder, and also the cottage at the works; a vat containing a large quantity of tar was upset, and the contents were lost; many street-lamps were blown down, and other minor injuries were sustained. I think it right to mention these matters now, so that they may not come hereafter as a surprise. It is a great misfortune that the Company should be subject to such visitations, and there is no alternative but to bear them. The Directors sincerely sympathize with the Shareholders in their disappointment. Everything possible has been done on this side to promote the success of Company, and we can only trust that the efforts of the new Manager wil work a beneficial change. The Directors are constantly urging a reduction of the expenses, and Mr. Darney is fully alive to our wishes on this point. I should mention that, as one means of reducing expenditure, the Directors have decided, while the Company remains in so depressed a condition, to make a very sensible diminution in the amount of their fees. With these remarks, I beg to move—"That the report and accounts now read be received and adopted;" but before putting the resolution I shall be happy to reply to any questions.

Mr. T. Chaloner Smith seconded the motion.

Mr. H. M'L. Backler said he wished to make a few remarks with regard to the present state of the Company, and also as to the report that had been submitted and the speech made by the Chairman, which would read, unfortunately, somewhat like a catalogue of woes. The reduction of capital was, he thought, a subject well worthy of the consideration of the Board, and he regretted that it should be deferred, although he admitted the wisdom of deferring it for the present. The position of the Shareholders was that whilst the property was worth 12s. 6d., they were liable to pay £2 15s. a share. It was true that this liability could not arise under ordinary circumstances, because there were no undertakings that would cause it to arise; but if any other undertakings were to be entered into, it was possible that the Company would be involved in something very serious in the way of future payments; and therefore he thought it was advisable to do as the Directors intended to do—namely, to exercise the greatest caution in any new undertakings in which they might be advised to engage, and not to be guided by the mere opinions of engineers in the matter. He should depend a great deal more on the judgment of the Directors than on that of the most able engineers in the land. To him, who was ignorant of the nature of the country and its special requirements, it appeared to be very unadvisable to send the gas such a long distance as 15 miles; and he thought nothing of the sort should be done. Whether it was advisable to erect a gasholder midway, and incur the expense of a station there, or to establish gas-works at the extremity, was another matter, that would, he supposed, entirely depend upon the advice given as to what that locality was likely to yield. As regarded the present state of the Company with reference to debentures, there were about £5000 of debentures outstanding. He believed some of them had been outstanding for several years, and there had not been the option of repaying them; but if that could be done it would be a decided advantage to the Company, because, in their present position, if those debentures were paid off, and a call of 5s. per share were made, it would enable the Company to pay 2½ instead of 2¼ per cent. It was possible that some of the holders of debentures would be willing to take their money. He should be glad to pay further calls at once, and to get rid of his liability, if the Directors, after having thoroughly examined the matter, thought it could be done judiciously, and would add to the prosperity of the Company; but it was a question that would require the most serious examination, and whether it would be carried or not, he was sure that what was best for the interests of the Company would be done by the Board. He was quite certain that most of the Directors had suffered a great deal of anxiety on account of the Company, and he sincerely sympathized with them, and felt much obliged to them for undertaking the management of the Company under such trying circumstances. He spoke not only for himself, as one of the largest Proprietors, but for the large body of Shareholders, when he put those points prominently forward. He thought that some means should be taken to reduce the liability of the Company. He did not care, nor, he believed, did the mass of the Shareholders, whether it was by making calls which would produce good interest, or by reducing the nominal amount. If a good investment of the uncalled capital were made, so much the better for the Shareholders. If the Directors would give their attention to these matters, they would have the thorough support of the Shareholders; and when he stated that that was the general opinion of those who held shares in the Company, it might, he thought, be of some use in strengthening the hands of the Board in carrying out the objects they had in view.

Mr. Strong said that he quite endorsed the remarks of the last speaker with reference to the necessity of obtaining thorough information as to the facts before the Directors felt justified in incurring further outlay. The Directors should not be content with any reports, but should ascertain the facts as to the number of population, the cost of carrying the gas to these different points, or of erecting a new establishment, before they could be justified in incurring such a large outlay as would necessarily follow from adopting the new scheme. It appeared to him that if the undertaking had been unfortunate in what was unquestionably the centre of population and business, it might only add to the unfortunate position of the Company if a further outlay were incurred in following customers who had left that centre. He would urge upon the Directors the necessity of exercising care previous to making an additional outlay.

The Chairman said the Directors would take particular precaution, before they entered upon a new undertaking of any sort, that they would consult the wishes of the Shareholders on the matter. As to the reduction of the capital, that had been in contemplation by the Directors, and they had decided on proposing something of that sort to the Shareholders; but in the meantime there came with the last mail the proposition to light these other places, and the Directors thought that the least they could do was to take some time to consider the matter, to ascertain from Mauritius what the prospects really were, also the signatures that would be obtained of those who would undertake to burn the gas, and then to lay before the Shareholders the possibility of reaching a certain consumption, together with the cost. It would then be for the Shareholders to consider whether they should decide to lay out any more money on the concern.

The motion for the adoption of the report was then put and carried unanimously.

On the motion of the Chairman, seconded by Mr. Stopford, Mr. Thomas Chaloner Smith was re-elected a Director of the Company.

Mr. T. C. Smith, in returning thanks, said that nobody could be more disappointed than he was at the position in which the Company then stood, more particularly as during the first year or two of their existence there was certainly every reasonable expectation that there would be a satisfactory progression. From his knowledge of other undertakings of a similar nature, he could say with all sincerity that the unfortunate circumstances which had affected their prosperity had arisen from causes which were entirely beyond the control of the Directors. One circumstance in which they were certainly most singularly unfortunate was that of losing one of the managers who had been sent out to Mauritius. The state of his health was such that he could not longer continue in the island, and he (Mr. Smith) firmly believed that if their late Manager had been able to continue, there would not have been so many losses in repairs and in damages which had occurred since his resignation. As they all knew, it was extremely difficult to get a good man to go out to the Mauritius. The climate of the island was trying, and the remuneration the Company were able to give was not such as to tempt a man to go out there at the risk of his life. From what was known of this new Manager, there was reason to believe that he would be the right man in the right place; and, as he said before, the Directors would do their best to avail themselves of any circumstances which might appear to be favourable to them; but the Shareholders might be perfectly certain that the Directors would not go into any fresh undertaking which they did not think afforded not only a chance of reasonable prosperity, but also certain prospects of success.

On the motion of Mr. Backler, seconded by Mr. Waterworth, the retiring Auditors, Messrs. John Robinson Peill and Thomas Newton Stokes, were re-elected.

Mr. T. C. Smith proposed that a dividend of 1s. per share be declared, and that that sum be paid free of income-tax on the 17th of May next.

Mr. Stopford seconded the motion, which was put and carried.

Mr. Stokes said the meeting could not separate without proposing a vote of thanks to the Chairman and Directors. He felt sure that the change in the management was a very wise step on their part, and he hoped that the result would prove highly satisfactory.

Mr. Wilkinson seconded the motion, and it was carried by acclamation.

The Chairman, in returning thanks on behalf of himself and co-Directors, said that the concern whose affairs they were met to discuss had given him and the Directors more trouble than anything else they ever had to do with. However, he was not one of those who, when the Company got into a difficulty, would run away from it, and get somebody else to manage it. If there was a chance of doing something else to make the concern better, the Directors would not hesitate to take the proper means to do it. They had, he hoped, made a change in the right direction in the appointment of a new Manager, and he trusted that there was still a chance of bringing the Company through the difficulties that had hitherto beset it.

The proceedings then terminated.

Liverpool Gas-Fittings Company, Limited.—The annual meeting of this Company was held last Tuesday—Mr. S. H. Thompson in the chair. The report of the Directors for the year ending the 31st of March, stated that the net profit on the year's working amounted to £1535 16s. 3d., which, together, with the sum of £657 17s. 11d., the balance remaining from the previous year, left the sum of £2913 14s. 2d. to the credit of profit and loss. The Directors recommended that a dividend be declared for the year at the rate of 10 per cent., with a bonus of 1s. per share, free of income-tax. This would leave a balance of £693 14s. 2d. to be carried forward to the next year's account. The Chairman, in moving the adoption of the report and accounts, said he had the satisfaction of stating that they were enabled to give a bonus over and above the 10 per cent. dividend which they last declared. They had had a good deal of business during the year, and the Directors had every reason to be satisfied with the profit which enabled them to recommend the dividend mentioned in the report. Sir Thomas Earle seconded the motion, which was unanimously adopted. A resolution declaring the proposed dividend was also passed. Sir Thomas Earle and Mr. J. A. Tinne were re-elected Directors of the Company, and Mr. D. O. Bateson was re-appointed Auditor. The Chairman, in replying to a vote of thanks to himself and his co-Directors, said, with regard to their profits, many people thought that something like a co-operative arrangement ought to be adopted, and that any excessive profits should go in reduction of charges to their customers. Of course they were not under any statutory obligation to enter into any arrangement of the kind, and in that respect they were in a very different position to the Gas Company. It was quite optional on the part of the public whether or not they purchased what the Company had to dispose of; still it was well that they should keep in view the idea of something of a co-operative nature—that any excess of profits beyond a reasonable return should be disposed of by a reduction of charges. Thanks were also voted to the Secretary (Mr. Samuel Haynes) and the other principal officers of the Company.

BAHIA GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the London Offices, on Thursday, the 22nd inst.—Edward Horner, Esq., in the chair.

The Secretary (Mr. A. J. Head) having read the notice convening the meeting, the following report and accounts were presented:—

The Directors herewith present the audited statement of accounts for the half year ending Dec. 31, 1878.

A portion of the defalcation reported in previous accounts having been recovered, the balance is now written off, together with the expenses of the investigation.

The appeal by the Directors against the imposition of customs duties, referred to in the last report, being still under the consideration of the Council of State at Rio, the Directors are as yet unable to report any result. As soon, however, as they receive a favourable reply, they will lose no time in shipping the remainder of the pipes required to complete the new system of mains, which, so far as it has been at present carried, has fully realized the results anticipated by the Engineer; enabling him to carry on the lighting with greater efficiency and satisfaction to the city, and with improved results to the Company.

The half year's working has resulted in a profit of £5286 18s. 8d. (after payment of extraordinary disbursements and balance of defalcation), which, added to the balance brought forward, makes the sum of £5481 10s. 1d.; out of which the Directors recommend the usual dividend on the preference shares, and a dividend at the rate of 4 per cent. per annum on the ordinary. This will absorb £4125, leaving £1356 10s. 1d. to carry forward.

Balance-Sheet, Dec. 31, 1878.

Dr.		Cr.	
Capital—		Concession	£7,000 0 0
5000 ordinary shares	£100,000 0 0	Investment to June 30, 1878	102,229 14 2
1000 10 per ct. preference shares	20,000 0 0	Additional during half year	878 17 4
1500 7½ ditto ditto	30,000 0 0	Freehold land	5,033 12 7
Debentures	2,650 0 0	Meters fixed	2,647 18 8
Creditors—		Office furniture and fixtures	336 13 4
On open accounts	666 17 7	Preliminary expenses	16,914 17 3
On acceptances	5,930 4 8	Suspense account—	
Dividends unpaid	32 4 3	Mains renewal	2,699 10 6
Debenture interest	73 14 1	Plant ,,	265 5 0
Insurance-fund	47 4 10	Amounts due for gas, fittings, &c.—	
Reserve-fund	2,500 0 0	Public lamps	1,617 7 6
Profit and loss	5,481 10 1	Public establishments	3,217 10 11
		Private rental, fittings, &c.	6,259 0 7
		Sundry debtors	482 12 2
		Stock—	
		Coals	5,650 10 9
		Coke	11 5 0
		Fittings	2,826 3 5
		Sundries	5,435 5 3
		Goods in transit	2,253 4 3
		Bills receivable	300 0 0
		Cash at Bankers—	
		General account	415 4 8
		Dividend account	105 18 4
		London and Brazilian Bank	590 18 6
		London office	10 5 4
	£167,381 15 6		£167,381 15 6

Revenue Account, for the Half Year ending Dec. 31, 1878.

Coals carbonized	£5,084 8 7	Gas supplied to public lamps	£9,803 16 3
Purifying materials and wages	230 19 4	Less fines	226 19 2
Carbonizing wages	1,128 4 4		£9,576 17 1
Wages, yardmen, &c.	225 19 1	Private consumers	6,777 11 3
Repairs, mains, and services	431 14 9	Public establishments	1,016 6 0
Lighting and repairing lamps	1,335 2 4	Meter-rental	539 16 5
Salaries	1,712 5 9	Products £2,447 16 3	
Directors fees	400 0 0	Less labour 94 6 3	
Auditors fees	21 0 0		2,353 10 0
Rent and taxes	227 14 1	Transfer fees	0 17 6
Interest and discount	184 6 11	Profit on fittings	294 6 0
Stationery	82 14 0	Bad debts recovered	7 7 4
Office expenses	19 0 0		
Trade charges	275 5 5		
Wear and tear	863 9 11		
Bad debts and allowances	389 6 11		
Exchange	463 3 9		
Law charges	10 5 4		
Extraordinary disbursements—			
Extension of retort-house—			
One-sixth of £687 17s. 5d. (last instalment)	114 12 10		
Renewal of mains—			
One-sixth of £585 16s. 5d. (5th instalment)	97 12 8		
One-sixth of £3424 19s. 0d. (3rd instalment)	570 16 6		
One-sixth of £560 18s. 5d. (2nd instalment)	93 9 9		
One-sixth of £618 10s. 10d. (1st instalment)	103 1 10		
Renewal of plant—			
One-sixth of £739 9s. 4d. (5th instalment)	123 4 10		
Defalcation suspense account balance	591 14 0		
Defalcation Mr. Kilkeary's expenses	500 0 0		
Balance—profit	6,286 18 8		
	£20,566 11 7		£20,566 11 7

Profit and Loss Account.

Dividends declared Nov. 26, 1878	£3,625 0 0	Balance of account to June 30, 1878	£3,894 16 11
Interest on debentures to Dec. 31, 1878	75 5 6	Revenue account, net profit for the half year ending Dec. 31, 1878	5,286 18 8
Balance	5,481 10 1		£9,181 15 7
	£9,181 15 7	Balance	£5,481 10 1

The Chairman, in moving the adoption of the report, said: I think I may congratulate the Shareholders upon some very considerable improvement in the state of the Company's affairs. The large mains which were sent out from this country appear now to be telling very considerably in our favour. It will be perceived that, to produce a rental larger than the corresponding time of last year, we have used very nearly 600 tons less of coals, that quantity having been saved in the shape of leakage, which has been brought down from a very large amount to the moderate proportion of 15 per cent., which, for foreign gas-works, and for such a very difficult place to light as Bahia, is very fairly creditable. We have not as yet entirely completed all that we wish to do with regard to the mains, as it has been thought prudent to desist from further outlay pending the negotiations which are going on with the Government to endeavour to get back the duty with which we have been charged, as well as to secure the further pipes we have sent out from being subject to so heavy a tax. That leads to some delay, and in this, as well as in other matters, the Company are not very flush in the way of money to expend on capital account. In fact, the very large sum which has been absorbed by the Government in duties paid upon the increased mains would, if we could recover it, enable us to complete what we think ought to be done, and leave a good balance to spare. In the meantime, it is not thought desirable to proceed further, entangling ourselves with these heavy duties, until we get some definite decision from the Government. With regard to the working, I think you will find the improvement is very great. In December, 1877, the receipts per ton were £5 0s. 9d. The receipts per ton in June, 1878, when the new mains had only come into partial operation, had improved to £5 12s. 9d., and now that they have been still further extended, the receipts have increased to £6 2s. 2d., being an improvement of 22s. per ton of coals shipped. I think you will say that is a very great advance. We hope when the system is completed that the improvement will be still greater. The result of this is that we are enabled to propose to the Shareholders a better dividend than they have had for some time. Notwithstanding the large amount of defalcation written off, as well as other exceptional expenses, there is a much larger profit left than there has been for a considerable period. In fact, if you look at the amount of money which is deducted from the profit in the shape of the instalments upon works which really belong to capital, and which have been paid for out of profit, you will see that the Company have made what may be considered a very respectable percentage. I think we may be congratulated on having turned the corner, and that we shall not only be able to keep to what we have done, but still further to improve on the amount we propose to pay you. With these observations, I will move—"That the report and statement of accounts now presented be and are hereby adopted."

The Deputy-Chairman (Mr. H. Brothers) seconded the motion.

Mr. Penny said that it must be very satisfactory to the Chairman as well as to the Shareholders, that since the last half-yearly meeting, the affairs of the Company should have improved in so marked a manner. At that time he had expressed some dissatisfaction with the results of the working, and he therefore thought it but fair on the present occasion to acknowledge the great change for the better that had taken place. Coals had cost £800 less than at the corresponding period of last year, and the receipts were a little more. The smaller expenditure for coals must mean either a smaller quantity used or a diminution in price.

The Chairman said that about 560 tons less had been used.

Mr. Penny observed that this was a proof that the leakage had been considerably reduced, and he hoped the remarks which had been made on this subject would have the effect of producing still further improvements in the future.

Mr. Dixon said he was glad to find that there had been a decided change in the management of the Company, and that the dividend which the Shareholders were to receive was higher than any previously declared. He hoped that the Directors would persevere in the course they were adopting, and by that means the Shareholders property would be greatly benefited.

Mr. Penny asked how long the concession had to run.

The Chairman: About ten years.

Mr. Penny: And what happens then?

The Chairman: The same as at Rio, perhaps. It is a very difficult question to answer.

Mr. Penny said he would not press the subject further at that time.

The Chairman said at the end of the term no doubt the Government had power to take the works at a valuation.

The motion was then put and agreed to.

The Chairman moved the payment of the usual dividends, for the year ending Dec. 31, 1878, on the preference capital, and at the rate of 4 per cent. on the ordinary capital.

Mr. C. Nicholson seconded the motion. In doing so, he alluded to the early difficulties of the Company, and congratulated the Shareholders most sincerely upon the improvement that had been effected in the condition of their affairs. One source of evil was the tyrannous conduct of the Brazilian Government. He was very glad to see that the fines with regard to public lamps were only £226 19s. 2d., because that was a smaller amount than they had been accustomed to for many years. He suggested whether perhaps it would be well to give up their claim upon the Government for the duties charged in consideration of an extended concession.

The Chairman said there was no doubt the duty paid upon the pipes was in violation of their concession, and the sum was so large that by the end of the ten years during which the concession had to run, adding compound interest to it, they will find, if they were to sacrifice it for a renewed concession, that they were really paying two or three times the amount paid for the original concession. He saw no reason why the concession should not be renewed. He apprehended there was nothing to fear on that score, but he did not see how they could make a bargain about it at present, and he certainly advised the Company not to relinquish their claim upon the Government in return for a future concession.

The resolution was then agreed to.

A vote of thanks to the Chairman and Directors brought the proceedings to a close.

The Glossop Gas Bill.—A letter, by the Engineer and Manager of the Glossop Gas Company (Mr. James Dalgliesh), published in one of the local papers, shows the result of the contest which has been carried on between the Corporation and the Company over the Bill. It says: "The following analysis of the Corporation's opposition to the Gas Company in Parliament is interesting and noteworthy:—

Corporation of Glossop.	*Committee of Lords.*
1. Objected to Gas Company having new Act.	1. Passed the Act.
2. Objected to any extension of district.	2. Granted the Company the small part asked for, when they knew that inhabitants of proposed new district did not object.
3. Said £10,000 new capital was sufficient	3. Granted £30,000 and borrowing powers.
4. Wanted price limited to 4s. per 1000 feet.	4. Granted 5s.
5. Said 5 per cent. dividend on new capital was sufficient.	5. Granted what Company asked—namely, 7 per cent. non-preferential shares, 6 per cent. preference shares.
6. Proposed to limit interest on borrowed money to 4 per cent.	6. Left it unlimited.
7. Asked for sliding scale, price of gas commencing with 3s. 6d. per 1000 feet.	7. Did not grant it.
8. Asked that illuminating power might be 18 candles.	8. Granted 15 candles, with Sugg's new burner, which is better for the Company than 14 candles with the old burner.
9. Asked for power to purchase the undertaking.	9. Did not grant it.
10. Proposed to cancel back dividends; amount owing, £3403 10s.	10. Did not do so.
11. Objected to the Company having the new site asked for.	11. Granted it.

Query.—What have the Corporation obtained for their expenditure of £1000? This £1000, and the Gas Company's expenses, will have to be paid by the gas consumers. Would it not have been better for the Corporation to have noticed the warnings as to the cost of opposition?" The report of the proceedings in the House of Commons has already appeared in the Journal; those in the House of Lords will be given in the next or succeeding number.

SAN PAULO GAS COMPANY, LIMITED.

The Ninth Annual Adjourned Meeting of this Company was held at the London Offices, Pinner's Hall, Great Winchester Street, on Wednesday, the 14th inst., when the following report for the six months ending Dec. 31, 1878, was adopted:—

The Directors have the pleasure to submit to the Shareholders the annexed statements of account for the six months ending Dec. 31, 1878, duly audited, which show that the total receipts for public and private lighting and rental of meters amount to £9464 2s. 11d., as against £8591 8s. 6d. in the corresponding six months of 1877, thus showing a very favourable increase in revenue, notwithstanding the continued low rate of exchange.

The net amount of revenue carried to profit and loss for the half year is £3945 10s. 5d., which, added to the amount brought forward, £1332 8s. 3d. (after payment of the last dividend in October, £2864 16s., and deduction of £308 16s. 6d. written off Maud and Co.'s debt) makes a total of £5277 18s. 8d., out of which the Directors recommend a dividend to be paid, for the six months, at the rate of 9 per cent. per annum, free of income-tax, amounting to £3304, and a further 20 per cent. to be taken off the balance of Maud and Co.'s debt (£247 1s. 4d.), carrying forward £1726 17s. 4d. to the present half year.

The public lighting has not yet been extended by the Government, but this extension is forcibly urged by the public at San Paulo, and it is now before the Provincial Legislative Assembly for decision.

The Gas Engineer reports the works to be in a very satisfactory state. Machinery and buildings in perfect order and repair.

Two of the Directors, S. F. Porter, Esq., and Fredk. Delmar, Esq., retire by rotation, and, being eligible, offer themselves for re-election.

The Auditor, Mr. W. Cash, also retires, and, being eligible, offers himself for re-election.

Dr.—*Revenue Account for the Six Months ending Dec. 31, 1878.*

To Cost of coal carbonized—			
Common, 613 tons 14 cwt.		£1,412 14	1
Cannel, 268 tons 3 cwt.		1,110 9	9
Lime and oxide of iron		57 18	0
Wages—			
Carbonizing		462 0	0
Purifying		20 11	11
General labour		133 9	7
Sundries, cement, fire-clay, oils, &c.		113 14	5
Lamplighters wages		311 0	0
Depreciation in value of hired fittings and meters, and of furniture in San Paulo and London		112 19	6
Repairs, &c.		280 15	1
Loss on fitting account		17 17	6
Bad debts		51 12	10
General charges in San Paulo, viz.—			
Alterations in office	£55 10 7		
Taxes	88 13 11		
Salaries	615 11 0		
Printing, stationery, &c.	19 3 0		
Rents	70 0 0		
Auditor's fee	25 0 0		
Insurance on works and plant	86 18 9		
Miscellaneous expenses	78 4 2		
		1,039 1	5
Loss on exchange		317 6	5
London charges, viz.—			
Salaries	£250 0 0		
Directors fees	300 0 0		
Sundry discounts	7 14 1		
Printing and stationery	20 19 0		
Advertising	26 7 0		
Rent and miscellaneous expenses	83 10 3		
		688 10	4
Balance carried to profit and loss account, being net revenue for the six months		4,213 5	11
		£10,343 6	9

Cr.—*Revenue Account.*

By Gas-rents—			
Public lights	£4,486 1 6		
Private lights	4,858 18 9		
Rental of meters on hire	119 2 8		
		£9,464 2	11
Coke sold	£794 12 2		
Tar sold	38 19 9		
		833 11	11
Rental of fittings on hire		45 11	11
		£10,343 6	9

BIRMINGHAM CORPORATION GAS SUPPLY.

At a Meeting of the Birmingham Town Council last Tuesday—the Deputy-Mayor (Alderman Kenrick) presiding—a report was presented from the Gas Committee, stating, among other things, that the manufacture of gas had been discontinued at Fazeley Street since the 4th of April, and when the stock of residuals on hand had been cleared, it was proposed to close the works for the present. The Committee would ultimately recommend that the works be abandoned as a manufacturing station, and the site disposed of, but until the additional plant necessary to meet the estimated increase in the demand for gas during the next winter had been provided, the works, it was proposed, should be kept available in case of need. In their last report the Committee stated that after the extensions in progress at Saltley were completed, it would be necessary, before the winter of 1880, to provide for an estimated additional maximum weekly sale of 6 million cubic feet of gas, and this provision could be best made at the Windsor Street works. The cost of carrying out certain extensions now proposed would be £17,000, and the maximum productive capacity of the works would be immediately increased by from 2½ to 3 millions per week. The sale of coke showed considerable improvement, and notwithstanding the large additional make during the past winter, the stock of coke was now smaller than at the corresponding period of last year. The sale of gas for the quarter ended the 31st of March had been 911,076,700 cubic feet, as against 813,939,500 cubic feet in the corresponding period of the previous year; being an increase of 97,137,200 cubic feet. The average illuminating power of the gas for the same quarter, as certified by the official tester (Mr. T. Jackson), was 17·32 candles. The number of cooking and heating stoves and gas-fires supplied by the department during the like period was 187.

Mr. Marris moved that the Gas Committee be authorized to expend the sum of £17,000 in additions to and improvements of the Windsor Street works. He said that the Council would be glad to hear that the increase in the sale of gas during the last quarter had made it necessary to seriously review their position. In the last report allusion was made to the same fact, and to the steps that were being taken to provide the necessary works for producing the increased quantity required. With reference to the works in Fazeley Street, they were very old, and the Council had been informed that it would be necessary to abandon them. They could only produce a small quantity of gas, and what they did produce was at a cost of about 3d. per 1000 feet more than at any other works. The plant could not properly be removed, and therefore it would be necessary to sell it. The Committee, however, intended to keep them in readiness until the extensions at Windsor Street and Saltley were completed, because they might require to use them during the next busy season. In the following season the Committee hoped to come before the Council and ask for authority to dispose of the site. The Council were told at the last meeting that the cheapest thing would be to fill up the existing buildings at Saltley. That had been done, and they had already provided 10 million feet of gas, leaving 6 million to be provided for next winter at Windsor Street. Of that quantity they could provide 3 million feet by considerably increasing the purifying appliances at those works. They could not obtain any help from the West Bromwich works until the districts were separated, and even then they would have to provide for Wednesbury and Darlaston from the works. The Committee had considered how they could best increase the purifying power of their plant. The greatest maximum weekly make at Windsor Street had been 25 million feet. If they could add 3 millions by additional appliances, they would then only be a like amount short of their requirements. In considering this, they had to allow for the ultimate utilization of the whole of the land at Windsor Street. There were 9 acres there, very well fitted for the manufacture of gas, but the Committee shrank at the present time from advising the Council to cover the whole of the space with new works. They believed it to be their wisest policy to do the work from time to time as occasion should arise. The whole of the land would be utilized, and the buildings so constructed as to derive the greatest possible advantage from the new railway, which was nearly completed, and which would run into the works. The Committee only asked the Council then to enable them to do what was absolutely necessary to carry them into the winter of 1880. The constant increase of consumption as given in the last report was about 6½ per cent. compound interest, and that increase compelled the Committee to look very considerably ahead of their immediate requirements. They proposed to build a station-meter house to contain ultimately four meters, but one would be sufficient for present wants, and only one would be provided. Then they had to build boiler-houses to contain all the boilers ultimately required, but they only furnished now as many as were required at once. The purifier-house would contain six purifiers, with the necessary hydraulic apparatus, and the house would be built to admit of easy extension. The weekly producing capacity of the whole of the works, after the extensions now authorized were completed, would be as follows:—Saltley, 56½ millions; Windsor Street, 28 millions; Adderley Street, 13½ millions; Swan Village, 17 millions; total, 115 millions cubic feet; with a reserve of 2½ to 3 millions at Fazeley Street. Additional workshops would be erected, so as to ease the building expenditure by making what fittings they could on their own premises. Of the £17,000, £2500 would be placed to the revenue account, and whenever they had to substitute one set of apparatus for another they placed the cost to the debit of revenue, and not to the capital account. The Committee were very strongly of opinion that it was the wisest course to keep down the capital account as much as possible.

Mr. J. E. Baker seconded the motion, and it was adopted.

A motion—"That the Committee be authorized to spend £1150 in additions to the plant of the West Bromwich works," was also agreed to.

Mr. Marris then moved the adoption of the report. In doing so, he said that the contract for works at Saltley amounted to £13,820. The Council had authorized an expenditure of £25,000, and with that expenditure the Committee would obtain the maximum production of 56½ million feet of gas. The works at Adderley Street were also progressing. The severe weather had made it necessary that they should purchase more coal, and it had been purchased on more favourable terms than the original contract in the summer. They had purchased 25,000 additional tons of coal, yet their stock was now only 2000 tons more than this time last year. He was happy to say that at last the Committee had turned a corner with regard to the coke. For some time he thought he should never be able to report favourably on that subject, and it had only been by the most persevering attention on the part of the Committee and of their Secretary (Mr. Edwin Smith) that they had been enabled to say that the stock of coke was less than it was at the same time last year. They had 15,000 tons less in stock, and they had made 15,000 tons more than in the previous year. The retail trade was improving very fast. He wished he could say as much for the Black Country trade. He was sorry that there seemed no sign of improvement in the outlook there. The demand, instead of growing greater, was becoming less—a state of things to be deplored in the interest of the district as well as of Birmingham. Still, if they could stimulate the retail trade they would never get into the same difficulty again as they were in the past year. The increase in the sale of gas was somewhat large. The winter had been very severe and protracted, and the increase had been at the rate of 12 per cent. over the corresponding period of last year. He could not, however, attribute the increase entirely to the winter, and he thought the policy of the Committee in stimulating the use of gas-fires and gas-cooking stoves had greatly conduced to this result. During the past few weeks there had been a large increase in the demand for fixing gas-stoves on hire, so that the department was very busy. He was of opinion that every gas apparatus that was adopted was a distinct help to the sanitary condition of the town—it would make a great difference in the atmosphere, and in the brightness and healthiness of the town.

Mr. M. J. Hart seconded the proposal, which was adopted, and the Council proceeded to other business.

HEREFORD CORPORATION GAS SUPPLY.

A Quarterly Meeting of the Hereford Town Council was held on Thursday, the 1st inst.—the Mayor (Mr. J. H. Knight) presiding—when the Gas Management Committee presented the annual statement of accounts, remarking: "The Auditor's report and statement of accounts, with balance-sheet for the year ending December last, together with a table prepared by the Manager (Mr. Davis), showing the working results of coal carbonized, gas produced, sold, &c., we lay before the Council. From this it will be seen that the production of gas per ton of coal carbonized has increased considerably, whilst the lost or unaccounted-for gas has slightly decreased; hence the large profit shown of £5050. This, we are assured, will be very satisfactory to the ratepayers generally, and it is very gratifying to us, for there are very few gas-works in the kingdom that can show equal results."

The following are the Auditor's report and the accounts:—

Hereford, April 2, 1879.

The Committee, Corporation Gas-Works, Hereford.

Gentlemen,—In compliance with your instructions, I have examined and audited the Corporation gas accounts for the year ending the 31st of December last, and herewith beg to hand you statement in the usual form.

In compiling the accounts for publication, I have deemed it best to set forth the capital account more in detail than formerly, and, as it is also in accordance with statutory form, I think it will commend itself on perusal. This was rendered necessary by reason of the commencement of the new works, and the desirability of showing clearly and separately the expenditure under that head.

Referring to the leading features of the accounts, it will be seen that there has been a profit made upon the trade account (B) of £5050 0s. 4d., as against £4634 6s. 1d. in 1877, showing an increase of £415 14s. 3d., which is chiefly accounted for by a reduced expenditure for coals and general repairs.

The result is most satisfactory, but when the profits upon the supplementary account are compared with those of the previous year (1877), a decrease is noticeable almost throughout, and may be principally explained by the absence of demand for fittings, and

the low price at which coke has been sold. The net result is that your surplus balance standing to credit, which in 1877 was £3604 16s. 6d., now stands at £4709 1s. 11d., or an addition of £1104 5s. 5d.

The most gratifying feature which the accounts bring before us is, however, the increase in gas-rental of £108 on account of private lights, showing clearly that the consumption by private consumers is steadily and substantially increasing.

The public have taken ready advantage of the discount allowed for prompt payment of their accounts, £424 7s. 9d. having been charged under that head.

I leave to your able Manager the duty of reporting upon the different results of gas manufacture, with which he is more intimately acquainted.

(Signed) J. W. Capner, Auditor.

Statement of Loan Capital on Dec. 31, 1878.

Year.	Description of Loan, Mortgage Bonds, &c.	Rate per Cent. of Interest.	Total Amount Borrowed, Dec. 31, 1878	Remaining to be Borrowed.	Total Amounts Authorized.
1872	Mortgage loan. . . .	4½	£55,000	—	£55,000
1875	Ditto	4 & 4½	1,500	—	1,500
1878	Mortgage bonds . . .	4	7,000	£23,000	30,000

A.—*Capital Account for the Year ending Dec. 31, 1878.*

	Expenditure to Dec. 31, 1877.	Expended this Year.	Total to Dec. 31, 1878.
Expenditure to date. . . .	£55,829 5 1 ..	— ..	£55,829 5 1
Subsequently—			
Lands acquired, including law charges	— ..	£5,379 14 10 ..	—
New buildings, manufacturing plant, machines, storeage works, and other structures connected with manufacture.	— ..	2,498 12 11 ..	—
New mains and service-pipes (not being in place of old), including laying same, paving, and other works connected with distribution . .	— ..	17 17 6 ..	—
			7,896 5 3
			£63,725 10 4

	Certified Receipts to Dec. 31, 1877.	Received this Year.	Total to Dec. 31, 1878.
Mortgages	£56,500 0 0 ..	— ..	£56,500 0 0
Bonds	— ..	£7,000 0 0 ..	7,000 0 0
Balance, excess expended per account E			225 10 4
			£63,725 10 4

B. Dr.—*Profit and Loss Account, Jan. 1 to Dec. 31, 1878.*

To Coals consumed, cost	£2,949 7 0	
Purifying	152 13 10	
General repairs, wear and tear	524 13 11	
Repairs to mains and services	21 3 3	
Lamplighting and repairs	248 5 8	
Gas-making, wages	623 6 8	
		£4,519 10 4
Salaries	£414 15 0	
Rates, taxes, and insurance	391 4 1	
Stationery, printing, &c.	44 19 6	
Law expenses	2 10 2	
		853 8 8
Total expenditure		£5,372 19 0
Net revenue account, C, balance transferred		5,050 0 4
		£10,422 19 4

Cr.—*Profit and Loss Account.*

By Gas-rental for public and private lights for twelve months . . .		£9,401 10 2
Residual products (less cartage and expenses), coke. .	£568 9 8	
Tar, liquor, &c.	354 0 1	
		922 9 9
Fittings, &c., profit thereon		39 15 2
Lamp repairs		8 3 0
Interest allowed by Bankers, &c.		52 18 10
Abatements		6 2 5
		£19,422 19 4

C. Dr.—*Net Revenue Account, Dec. 31, 1878.*

To Interest paid on mortgage (1872) to the 30th of June last	£1,107 19 10
Interest accrued and owing on ditto at this date	1,078 6 2
Interest paid, July 1, on additional loan (1875)	29 19 0
Interest accrued and owing on ditto at this date	28 12 11
Interest on New Works Loan (1878) accrued and owing at this date.	142 7 7
Amount repaid City Treasurer	452 2 5
Loan redemption-fund, amount repaid, account D	1,173 9 6
	£4,012 17 5
Balance surplus to new account, 1879	4,709 1 11
	£8,721 19 4

Cr.—*Net Revenue Account.*

By Balance brought from last account	£3,604 16 6
Profit undercalculated Dec. 31, 1877.	67 2 6
Balance brought from profit and loss account, B, being profits for twelve months to this date	5,050 0 4
	£8,721 19 4

D. Dr.—*Loan Redemption Fund, Dec. 31, 1878.*

To Loan, 1872, repaid to July, 1877	£4,932 0 6	
Do., 1875, repaid to July, 1877	100 0 0	
		£5,032 0 6
Do., 1872, further repaid to July, 1878.	1,123 9 6	
Do., 1875, further repaid to July, 1878.	50 0 0	
		1,173 9 6
		£6,205 10 0
Balance unpaid		57,294 10 0
		£63,500 0 0

Cr.—*Loan Redemption Fund.*

By Loan, 1872	£55,000 0 0	
Do., 1875	1,500 0 0	
Do., 1878	7,000 0 0	
		£63,500 0 0
		£63,500 0 0

E. Dr.—*General Balance-Sheet, Dec. 31, 1878.*

To Sundry tradesmen and others—amounts due for plant, coal, fittings, &c.		£2,036 6 8
Interest accrued and unpaid on mortgages. . . .	£1,078 6 2	
This date	28 12 11	
		1,106 19 1
Do. new works loan		142 7 7
Amount due to the Treasurer		85 14 5
		£3,321 7 9
Net revenue account, C, balance at credit		4,709 1 11
		£8,030 9 8

Cr.—*General Balance-Sheet.*

By Balance to capital account, A		£225 10 4
Amount owing by debtors for gas and water rental, including the quarter's rental ending at this date . .	£3,220 12 10	
Less deposits received	41 10 0	
		3,179 2 10
Debtors for residuals, viz. :—		
Coke	£429 13 4	
Tar	104 3 2	
Lime	9 12 5	
Liquor	34 19 0	
Fittings	165 10 10	
		743 18 9
Stock of materials on hand, viz.:—		
Coals	£242 18 0	
Fittings and general stock	513 1 7	
Purifying materials.	39 0 0	
Coke	11 2 0	
Tar and ammonia	30 0 0	
Gas.	5 18 6	
		842 0 1
City Finance Committee		500 0 0
Cash on deposit at Bankers		2,500 0 0
Cash in hands of Manager		39 17 8
		£8,030 9 8

Table *showing Coal Carbonized, Gas Produced, and Coke and Gas Sold during the Year ending Dec. 31, 1878.*

Coal and Cannel Carbonized.		Coke Sold.		Gas Made.	Gas left Works.	Gas Consumed and Accounted for.			Used in Works.	Gas Lost.
						Private Lights.	Public Lamps.	By Contract.		
Tons.	Cwt.	Tons.	Cwt.	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.
4,893	17	2,076	2	54,654,000	54,637,000	39,863,700	8,183,000	94,000	700,000	5,696,300

Gas in stock, Jan. 1, 1878	62,000 cubic feet.
Ditto, Jan. 1, 1879	79,000 ,,
Maximum quantity produced in 24 hours . . .	275,000 ,,
Ditto left works, ditto	296,000 ,,
Average production of gas per ton of coal	11,167 ,,
Average sold and accounted for per ton of coal . .	10,000 ,,
Lost or unaccounted for	10·42 per ct. of gas made.
Average quality of gas	14·50 candles.

Mr. Ralph, in moving the adoption of the Gas Management Committee's report, said he trusted the Committee would regard the annual accounts as of a highly satisfactory character. They showed that the profits of the past year had been as good as, and, he thought, upon the whole, better than in any previous year. The gross profits had been over £5000. There was no doubt that this satisfactory result was in a very great measure to be accounted for in the very able way in which the works were managed. As would be observed from the report of the Manager (Mr. Davis) the quantity of gas which was obtained from every ton of coal consumed, he believed, would bear comparison with any other works in the kingdom. Although the price might be considered large, and some persons might say that they had been charged more for gas than they ought to have been charged, he did not think so. Last year the Council agreed to take off discount, and they had used cannel coal in order to improve the quality of the gas. He thought, those facts being considered, they were selling gas as cheaply as it was being sold in other towns similarly situated and of similar size in the kingdom. He was gratified that the works were being constructed in the most able and economical manner, and he thought, in justice to Mr. Davis, he ought to say that if he was spending his own money, he could not exercise more care and discretion than he was in spending the money of the ratepayers. No doubt every one would be of opinion, on visiting the works, that Mr. Davis had very ably performed the part of Engineer for the works.

Alderman Anthony said he had pleasure in seconding the motion, because it gave him an opportunity of again congratulating the city of Hereford upon having, though late in the day, purchased the Hereford Gas-Works. He believed the works were A1 as a commercial concern in the city of Hereford; and amongst their most prosperous citizens he did not know of one firm that could boast of such success—the profit of last year being upwards of £5000, the gross outgoings having been under £10,000.

Mr. Shellard said he did not wish to raise a question upon the report, because from beginning to end it was of a very satisfactory character. For the last 30 years he had taken a prominent part in anything affecting the question of gas in the city of Hereford. When he first became acquainted with gas in Hereford, it was selling at 8s. per 1000 feet; and there had not been a reduction, from that time till now, that he had not had a voice or taken an active part in promoting. He hoped and trusted that when the Committee reported to the Council again, they would report that they had resolved to give the consumers of gas the benefit of another 3d. per 1000 feet in the way of discount on the price of gas.

The Mayor said he had to confess some little disappointment at not reading in the report a proposal that some reduction should be made to relieve the gas consumers in the city with regard to the price of gas; but the reduction ought to affect the public as well as the private lights. It appeared that the profits had been over £5000 on £9400 rental. That was, in round figures, 50 per cent. The proposal for reducing the price of gas was a question for the Committee to consider, because they knew more of the ins and outs of the management than anybody who had not taken an active interest in it. He merely threw it out for the Committee to consider, before they reported again, whether they could recommend the Council to make any reduction in the cost of gas.

The report was unanimously adopted.

Gas-Works in Queensland.—A correspondent informs us that, spite of electric light, gas-works are multiplying in Queensland. Ipswich, Maryborough, Toowoomba, and Townsville are all proposing the erection of gas-works.

MIDLAND ASSOCIATION OF GAS MANAGERS.

At the Sixth Quarterly Meeting of this Association, held at Birmingham on Thursday, the 1st inst.—Mr. CHARLES HUNT, of Birmingham, the President, in the chair—a paper was read by Mr. C. E. JONES (Chesterfield)

ON PUBLIC LIGHTING, WITH SPECIAL REFERENCE TO STREETS, ETC.

The paper commenced with a few remarks on the use of artificial lights in the past ages. It then proceeds: But we pass on to treat more particularly that branch of our industry selected for to-day's consideration—viz., public lighting, the discussion of which I hope may interest and benefit each one of us. It is a subject that certainly has not received too much attention, and perhaps its unremunerative character is responsible for the lack of interest manifested in its development; but even this consideration should not deter us from endeavouring to bring to perfection every branch of our profession.

The chief requirements of public lights are—(*a*) steadiness of flame, not susceptible to atmospheric commotion; (*b*) uniformity of intensity; (*c*) great penetrating power; (*d*) great diffusive power; (*e*) ever available without preparation, and easily lighted; (*f*) non-liability to any sudden or self-extinguishment; (*g*) shadowless; (*h*) commercially cheap.

The first of these is effected by the kind of burner used, and the form of lantern employed to shield the light. Upon the selection of the material to produce the light depends *b*, *c*, *d*, and *e*; *f* is chiefly a matter of interruption in supply or mechanical defect; *g* refers to the form of support and the structure of the lantern; *h* we will consider collaterally.

In the wide range of materials from which artificial light can be produced, that which fulfils most of the above requirements is coal gas. No other source of light at present known possesses the inherent qualities of coal gas in anything like a corresponding degree, and the light-givers which the more nearly approach it have a similar composition, being hydrocarbons. Candles and oil have been tried over and over again, both remotely and recently, with the result of leaving coal gas the master of the situation. To coal gas, then, the public returns, being won back to the old love by its very many excellent and unique qualifications; and if we this day advance the just claims of coal gas, and bring out more prominently than hitherto its useful and specific features, we shall not have spent our time in vain, however imperfectly the subject may have been put before you.

To secure a successful combination of the above conditions may be considered by some to be practically impossible, the nature of the service demanded being of such a varying character, depending upon the union of circumstances exceedingly difficult to effect; but if we cannot ensure theoretical perfection, we must strive to secure a position as near to it as is possible in our particular and individual cases.

By a little study of the foregoing principles which I have submitted to your consideration, and careful attention to the details of their application, considerable improvement can be effected in public lighting without any very great outlay. Some excuse may be found for our forefathers upon the ground of ignorance; but that cannot apply to ourselves in the present day, when knowledge is universal. The ancient cry was, "Where shall wisdom be found?" Now the answer is, "It crieth on the housetops," and knowledge, says Solomon, "increaseth strength;" so that if we are already strong, the increase of our knowledge makes us stronger, and the future of all undertakings is safe when directed by the "excellency of knowledge." Let us, then, widen the foundations of our professional fabric by showing the public which is the right path to tread, the right way to use the light they pay for street illuminations, and if they refuse to follow our advice and direction, we shall still possess the consciousness of having done our duty.

Before the introduction of gas lighting, very little sound knowledge existed generally of the laws that govern the combustion of inflammable bodies; and much of the extraordinary progress made by science is attributable to coal gas. This accounts, to a large extent, for the want of success attending the earlier efforts to light thoroughfares. The earliest forms of oil or candle lamps that I have met with were apparently designed by unskilful people, totally ignorant of the commonest principles of combustion, and no effort was made to obtain the maximum amount of light from the materials at their command. We find some with scarcely any airways, or perforated in such a manner that the carbon became deposited in graceful festoons of soot, which you will agree with me is "matter in the wrong place" in a lamp, rendering the instrument practically useless for the purpose for which it was intended. When coal gas superseded oil as a public illuminant, the old form of lantern was retained and largely used, or others made in partial imitation of it, and to this circumstance may be traced some of the evils attending the present system of street lighting. Had we to begin *de novo* without such examples to follow, or vested interests to consider, far better and more suitable lamps would be produced, and the public lighting rendered much more effective.

To make matters worse, when gas-works became multiplied, no particular pattern of bracket or lamp-column was adopted. No uniformity in height, strength, size, or distance apart was observed by engineers. Each put into practice his own ideas of taste, or what he thought the best for the locality he had to illuminate, regardless of the physical principles of light or the chemical laws of combustion. Hence we find an astonishing variety and diversity of the shapes in both lamp-columns and brackets, some being designed with filigree work, called "ornamental," and so placed as to obstruct the downward rays of light, and darken most effectually the pavement in the immediate neighbourhood of the lamp. This desire of ornamentation extended to the lanterns, and scroll-work added its shadow to that of the support; while the metallic ribs and angles were made so wide as to amount in some cases to 10 per cent. of the whole surface of the glass, and consequently augmented the evil. Uniformity in the rate of combustion was disregarded, or a quantity per hour adopted without due regard to the quality of the gas to be supplied, and when a town was well lighted, it was more an accidental circumstance than otherwise.

I have observed in many towns new lamps being put up which embodied all the defects of the old ones, and, of course, with a like result. The public lighting of the Metropolis, except in certain places, is perfectly disgraceful, and reflects no credit on the Companies or the Local Authorities; while in Birmingham, with every deference to our valued President, a state of things exists which is little better. In many large towns, notably in Scotland, where the street lighting does not appear to be of the slightest consequence, or else is regarded with very little interest, the effect is most disappointing, particularly when we remember the high illuminating power of the gas there as compared with places in the South. There is scarcely a town with which fault cannot be found, though it must be confessed there are a few in the South that are fairly lighted, and I hope before long to witness a general improvement in this much-needed direction. Of course, the change will not be a sudden one. The capital invested in lighting plant cannot be sacrificed; but when renewing broken lamps, or re-arranging their situations, much can be quietly effected, whilst in new streets or districts no obstacle can interfere to prevent the adoption of suitable light-giving apparatus.

It is evident that designers and manufacturers have not paid attention to this branch of the subject, inasmuch as the designing and manufacturing of grotesque columns and brackets is still going on. In bracket lamps, instances might be advanced *ad infinitum* of intricate designing of ornamentation, and flagrant disregard of the physical properties of light, and so long as encouragement is given to manufacturers to elaborate these articles in opposition to good taste, in defiance of common sense and the true principles of utilitarianism, so long shall we be doomed to have badly-lighted streets and thoroughfares, and so waste the light-giving power of the gas. Not only is the designing and constructing of lamp-columns, brackets, and lantern-frames defective, but oftentimes the commonest glass is used for glazing, and a great interception of light takes place from this cause alone. After putting a good light into a lamp, it is not at all an uncommon thing for a lamp contractor to obscure it with dim and gloomy glass.

Glass, as you all know, is manufactured by fusing silicic acid with carbonate of soda or potash. The transparent material so obtained is incapable, however, of resisting atmospheric influences, and water alone will dissolve it in time. The glass-maker, therefore, has to add small portions of lime, or baryta, or the oxides of iron, lead, or zinc, to enable the compound to resist the action of the atmosphere. The commonest glass consists chiefly of silicate of lime, some proportion of the silicates of the alkalies, of alumina, and oxide of iron. Some kinds of window-glass are very little better than the commonest bottle glass; and we shall therefore find it of service to us if we pause to consider the composition of glass, since more depends upon the quality of this material than many people suppose.

The composition of window glass is usually as follows:—

Soda	13·3 per cent.
Lime	12·9 ,,
Silicic acid	61·1 ,,

with a trace of alumina. Now, soda imparts a green tinge to glass, so much so that in the manufacture of crown glass, the variety largely used for optical purposes, it cannot be used, and potash has to be substituted, the proportions usually being—

Potash	22·0 per cent.
Lime	12·5 ,,
Silicic acid	62·0 ,,

According to an analysis of Faraday's, English flint glass has the following composition:—

Silica	51·93 per cent.
Oxide of potassium	13·77 ,,
Oxide of lead	33·28 ,,

A small proportion of oxide of iron gives a dark colour to glass, and it is as well to remember, when selecting glass for lamps, that, next to its brilliancy, its power of resisting atmospheric influences should be considered. In manufacturing towns the atmosphere soon destroys the polish of the surface, and cheap glass is soon "etched" in this way. It is therefore more economical to use a clear, brilliant, hard glass, though its first cost may be more than many of the dull wavy varieties manufactured from gas lime, soda waste, clay, and rock salt, and largely used by speculating builders for windows, and unwise gas managers and avaricious lamp contractors for street-lamps. The rougher the surface of the glass, the sooner does it become dirty, and the more readily are the rays of light intercepted; whereas a good clear, smooth glass will keep cleaner for a longer period, and allow the light to pass readily through.

Whatever media are used to enclose the light, it is inevitable that some loss will be sustained. This loss is not invariably the same for the same medium, but varies with the penetrative power of the flame, and likewise the distance from the flame. The larger the flame the smaller the loss up to a certain point; thus a strong argument is supplied in favour of larger burners in street-lamps. Some experimentalists have arrived at the conclusion that window glass occasions a loss of light equal to 9 per cent.; but unless we are told what kind of window glass was used, this statement is certainly vague if not misleading, glass of nearly all qualities, with varying powers of light-interception, being used for windows.

The following are the results of my own experiments, conducted with great care, every precaution being taken to eliminate all sources of error:—

The first series of experiments were made with a pane of clear hard 15oz. English glass, quite new, free from flaws, and possessing a good polish, but identical with the kind I use for street-lamps; the only difference being that care was used in its selection—in fact, it was the best of its kind. The illuminating power of the gas used was 16·25 candles, and the loss of light by the interposition of this glass was only 1·78 per cent. Having procured from a glazier a similar sized sheet with wavy lines and air globules or bubbles in it, a wretched specimen, though perfectly new and clean, I found the loss of light to be 14·38 per cent.; therefore, by using this common foreign glass for glazing lamps, we sacrifice some 12½ per cent. of the light-rays, which would otherwise be utilized by employing a glass equal to that used in the first series of experiments.

I next tested a pane of glass that had been in use for some time, and purposely allowed to become dirty, and to some extent also smoky. The result was remarkable, no less than 83·81 per cent. of light being obstructed. The same glass, even when cleaned, intercepted 16·92 per cent. of the light. This demonstrates the desirability of more frequent cleaning, and also exhibits the etching power of the atmosphere when charged with impurities, and the feeble resistance offered by the glass to its chemical action. By subtracting the percentage of the first-named experiment from the 16·92, thus: 16·92 — 1·78, we have 15·14 as the percentage of obstruction due to the corrosive wear of the glass when subjected to atmospheric influences in a manufacturing district containing chemical works and potteries. It would be interesting to know in what period of time this deterioration or etching was effected; but that information, I regret to say, I am unable to give with strict accuracy, notwithstanding that I believe I am quite safe in this instance at putting it at from three to four years.

Red and ruby glass is frequently used for private lamps over shop-doors, hotels, &c. I find their power of intercepting light varies with the intensity of colour, and not so much with the thickness of the glass, as one would almost expect. A very thin specimen intercepted 61·36 per cent. of the light, while a sheet very much thicker only obstructed the light-rays to the extent of 51·76 per cent.; the average of all my experiments being 48·08 per cent. Red glass is produced by the addition of suboxide of copper, and the finest ruby glass contains a little gold, 1-100th part of a grain of gold being sufficient to impart a deep rose colour to a cubic inch of fluid; while oxide of cobalt is used to produce the magnificent blue which usually adorns the portals of police stations. Such glass, when quite plain and without clear spaces upon it, such as the word "station," &c., obstructs artificial light to the extent of 38·13 per cent. Various experiments with ground sheet and other ground glass induced me to place the loss of light at 22·32 per cent., while glass coloured yellow by the oxide of antimony only intercepted 11·64 per cent. of light.

In the laying of gas-lamp services, workmen are often either too idle or too ignorant to select good soil with which to surround the pipe. In corrosive soils, such as contain the compounds of iron, lime, and acids, pipes are soon destroyed or "eaten away," and the least subsidence or disturbance of the surface—oftentimes the vibration of the roadway caused

by the passing traffic—is sufficient to occasion a leakage of gas. In the absence of casing, the durability of service-pipes may be increased by surrounding the pipe in the trench with mould, sawdust, or clay, and the latter is much better if burnt. This should extend the whole length of the pipe, and not be put in the trench at intervals.

I have here a sample of lead pipe eaten away by plaster made partly with ashes from a colliery. The destructive action of this material can be more easily imagined when I tell you that four months sufficed to effect the ruin of the pipe. I have frequently taken up from streets iron pipes presenting similar features, and I have no doubt the Members of this Association have had similar experience. Where the substratum of roads and streets consists chiefly of ashes and cinders from factories, steam-boilers, and so forth, the life of lead or iron pipes is of short duration, and since we have no power to direct road authorities, or to specify and compel the use of certain materials in road-making, we must endeavour to preserve our distributing apparatus by adopting every precaution in our power, with the view of increasing its durability. It is a good plan to give iron pipes a coat of paint, allowing the same to dry and harden before the pipes are used. After many years experience, I find the preservative properties of coal tar very efficacious, and I still use that residual for painting wrought-iron services. Lead services for gas I invariably enclose in wood, and no doubt it would in many cases be economical to encase wrought-iron ones in a similar manner.

Of stoppages by frost or naphthaline little need be said; but next to the application of heat, I have found spirits of wine and benzole useful agents in removing the obstructions so caused. By abolishing elbows and sharp corners, much trouble would be saved gas managers in frosty weather, as obstructions usually commence in elbows, while bends are comparatively free. Service-pipes laid at an insufficient depth in the ground, or in intensely cold situations, favour the deposition of naphthaline, and bring a train of evils at a season when general managers of gas-works have sufficient to occupy their attention without the luxury of frozen lamps. The size of the pipe, too, should be ¾-inch underground, and not less than ½-inch to the cock, provided the ingenuity of the lamp-post maker has not effectually debarred you from putting in a suitably sized pipe. In some of the older columns it is impossible to get even a ½-inch pipe through the neck of the post, and I have found it necessary to place the service-pipe outside, instead of inside the column, where, of course, it would be protected.

To have to contend against the idiosyncrasies of pattern makers and ironfounders, in addition to our other multifarious duties, is a grievous imposition which calls loudly for redress, if not justifying open rebellion. Manufacturers of lamp-columns, like chandelier makers, evidently believe that one size of pipe is equally applicable for one light or ten. *O tempora! O mores!*

The painting of lamps, brackets, and columns may appear as a small matter, but upon the colour of the material employed for the purpose depends a great deal of the success of reflecting the rays of light. Since black absorbs all the rays of light, and white, on the contrary, reflects them, white paint must be the most suitable material considered in this sense, possessing as it does the highest reflecting power. In manufacturing districts, however, white is an expensive paint to use, on account of the short time it keeps clean; nevertheless, it can be advantageously employed in many towns. All lanterns should be painted white inside, and the columns or brackets as light a colour as circumstances will permit; and it is high time that the practice of painting about half an inch of the glass, as well as the metallic frame, should be discontinued. Such artistic work by lamp painters should be executed elsewhere, it being decidedly objectionable on a street-lamp.

Considerable improvement might be effected in street lighting by the more frequent cleaning of the lamps. In the Metropolis, if I remember rightly, the lamps are cleaned twice a week; but the practice in most provincial towns is to clean once a week. In summer time once a week is perhaps often enough in some places; but in the winter months, lamps require cleaning twice a week, and it would be well if local authorities could be induced to pay the slight additional cost of such service, and thereby increase the lighting power they grudgingly pay for. As the cry now is "More light," here is a cheap and easily available source of its augmentation for the purposes to which this paper refers, and I commend its consideration to the authorities interested.

Good burners, suitable for the quality of the gas supplied, are indispensable for success in public lighting; and since it is almost impossible, from causes familiar to us all, to maintain the pressure in the distributory apparatus at one uniform point, governors, capable of delivering a constant volume per hour within a reasonable range of variation of pressure should be attached to each burner. Regularity of supply, steadiness of flame, and uniformity of amount or of volume of light, are consummations "devoutly to be wished" in street lighting, and I know of no instrument so likely to assist in the attainment of these considerations than a properly constructed lamp governor. Too little attention has been bestowed upon burners. It is no uncommon sight to see a lamp, costing some £5 or £10, lighted with a vile burner that might have cost the extravagant sum of one penny, and if such a mean and contemptible detractor of the illuminating power of coal gas does not succeed in bringing the gas manufacturer into disrepute, as well as in creating numerous collateral annoyances, it will be a matter of profound amazement. The lamp governor maker has, of necessity, to test his governors with gas in order to ascertain soundness of workmanship, and accuracy of adjustment, and in so doing he tests the burner at the same time, and if it happens to be a bad one, he rejects it and substitutes a better. Here, then, is a guarantee that the burner is a reasonably good one; still the gas manager will find it to his advantage to frequently try his lamp burners and governors, as a check upon undue consumption of gas, and upon the governor manufacturer.

The normal rate of consumption for common gas I shall assume to be 5 cubic feet per hour; for cannel gas it is muchless, usually 2 to 3 cubic feet. Now, remembering that the intensity of artificial light such as coal gas is increased in a greater ratio than the ratio of the cost of the illuminant, it is most unfortunate that the normal rate of consumption for street-lighting has drifted so low as 5 cubic feet. For common, or 16-candle gas, 6 feet should certainly, in my opinion, be the minimum; and as I venture to think that the days of cannel gas are justly doomed, and to hope that Parliament will ere long establish an uniform and universal standard of gaslight—thus removing the anomalies in this respect that at present exist—cannel may be left out of consideration just now. But I trust, Mr. President, you will permit me to observe, *en passant*, that I consider, with our present burners, patent or otherwise, gas exceeding 20-candle power is of no advantage to the general public.

The size of service-pipes attached above ground to lamps with single lights, as mentioned before, should not be less than ½-inch, carried to a point as near the lamp as convenient, with a lamp-cock having a long and a short arm, to indicate, by its position during the day, when the cock is shut, and the flow of gas stopped. From practical experience of the carelessness of lamplighters, I am driven to the conclusion that quantities of gas are wasted by imperfect gas-cocks, and the thoughtlessness, rather than the wilfulness of the lamplighters.

The height of the lamp-columns and brackets is very varying indeed, and I am disposed to think that the average height might be reduced with benefit to the thoroughfares and the traffic thereon. In my own district the range of variation extends from 9 ft. 6 in. to 14 ft. 9 in. I have no hesitation in recommending, for columns 70 yards apart, a height of 11 feet from the ground to the centre of the flame. The same applies to bracket lights, where it is practicable to fix them at this height, although it so frequently happens that brackets are subject to an arbitrary rule, and very little choice is left in the matter, as they often have to be fixed between doors and windows, panels, and in similar places, or not at all.

The old ladder lighting I shall assume to be extinct, and suppose the pole-lamp to be universally used for lighting street-lamps. The number of lamps a man can light with the pole-lamp being much greater than with the ladder, the economy in wages should ensure its adoption; though I must confess that room exists for considerable improvement in the construction of pole lighting lamps, and I hope ingenious inventors will give us something less cumbersome than those of the present forms. The number of lamps a man can light in an hour will, of course, depend upon distance, or, technically speaking, "the run." The closer the lamps, the larger the number a man can light in a given time. The physical conformation of the district, the hills and dales, will retard or accelerate his speed; and the facility with which he can turn the tap, light the gas, and withdraw the lighter, will, of course, influence his work materially. As a general rule, a lamp takes an average of 25 to 30 seconds to light, and this is a fair speed for a lighter to keep up with lamps 70 yards apart.

The simultaneous lighting and extinguishing of street-lamps is, however, greatly to be desired, and inventions like that of Mr. St. George Lane Fox, in which electricity is the agent employed, appear to evince the greatest promise of success; but until that good time comes we must plod along with the best means we can obtain. It would be too great a trial of your patience to allude, however briefly, to a tithe of the numerous inventions bearing upon this part of the subject, and also upon lanterns. Suffice it to say that I cheerfully bear testimony to the excellence of many of them, and would not wish to write one word to discourage the inventive energy of those who are working in this direction. There is a large field and full scope for time and talents in the area covered by the title of this paper, and, although it may seem somewhat ungenerous not to notice the efforts which many men have made, and the results they have secured, such a course cannot, for the reason stated, be followed in this instance. The same applies to the lime light, the albo-carbon light, and others; but it would perhaps be scarcely pardonable if I omitted to allude to a light which has recently exercised such a depreciating and disastrous influence upon gas property in this country—a light by no means new, but one that has, within the last few years, made wonderful strides towards the goal of perfection.

It would ill become us as disciples of Science and searchers after the secrets locked up by Truth in the world of scientific research, to complain of or lament over any discovery, or any adaptation of discoveries, likely to lead to a result beneficial to mankind. As scientific men, we rejoice that the march of intellectuality is onward, onward, and onward, and we cheerfully welcome any discovery or invention that will afford intellectual gratification, or add to the comfort and welfare of the world. Animated by these feelings must every one have been who witnessed the experiences with the electric light at the Curzon Hall, in this town, in October last. For myself, I went on to London that night, and acquired what information I could respecting what was thought to be a powerful rival, and the ultimate annihilator of the gas industry. I have formed the opinion, which I have publicly expressed, that this light, in its present stage of development, can scarcely be called a competitor with coal gas, where that article is sold reasonably cheap. If coal gas were seven or eight times the cost it is, some colourable pretence would exist for anxiety respecting our industry; and even then the many advantages possessed by coal gas would effectually preclude the possibility of its being superseded by electricity. But let it not be supposed for an instant that we are prejudiced against the electric light because it is produced from a source distinct from that which evolves coal gas: on the contrary, we welcome all improvement, and if any think the world is to stand still, like the heavenly bodies did at the command of Joshua, for their convenience and interest, they resemble the foolish virgins who neglected to keep their lamps in trim, and I verily hope that none such belong to our profession. However, as the custodians of the capital invested in gas undertakings, we should fail in our public duties did we remain silent or neglect to use due vigilance, or to exercise honest criticism or to relax in our efforts to serve our respective boards or committees with all our might, or to satisfy the reasonable demands of the public. There is nothing that electricity has done within the range of the title of this paper, but what can be easily accomplished by coal gas. Do you require a small, certain, and controllable light? Gas is at your elbow, and at present electricity is not. Do you wish for large and intense lights? Gas is your willing agent. From the faintest glimmer of a rushlight to the concentrated glare of 3000 standard candles, is a range of radiant power possessed at present by no other artificial illuminating agent in the world.

Upon the experimental tests of such eminent men as Dr. Tyndall, F.R.S., and Professor Valentin, the Wigham burner with 108 jets, consuming 308 cubic feet of cannel gas, gave a light equal to 2923·4 sperm candles burning 120 grains per hour. Now, 108 cubic feet of cannel gas would probably cost 6d. or 7d., and what would be the cost of electricity to produce the same amount of light? According to the Committee appointed by The Gaslight and Coke Company to ascertain the relative power and cost of the electric light and gas, the cost of producing by electricity a light equal in intensity to 1727 candles is, if worked by a steam-engine, 4s. 6d. per hour; if worked by a gas-engine, 3s. 3d. per hour; and, if the light be shaded by opal glass, 50 per cent. of the light being intercepted, the cost is 9s. per hour.

Colonel Haywood, the Engineer and Surveyor to the Corporation of the City of London, estimates, from trials made in the Metropolis, that the cost of the electric light is 7½ times that of gas. This is independent authority, and worthy of all acceptation; so that we will take 4s. 4d. per hour as the cost of a light approaching that mentioned above.

Notwithstanding its great cost, the electric light is a most useful one, and for some classes of work, where expense is no object, and time or circumstances will not allow of the production and use of gas, it will doubtless be largely employed; but where gas is available, as it always is in towns, preference will be given, on the score of economy, to the chief commodity of the gas engineer. The products of combustion, too, of coal gas are, I believe, far less injurious than the compounds of nitrogen produced by the electric light. The compounds of sulphur and oxygen are far less chemically active than compounds of nitrogen and oxygen; and the extensive use of the electric light in buildings or close rooms will not long be tolerated by those who have used coal gas. Even the fishmongers and traders at Billingsgate Market, after a trial of electricity, penitently returned to their old love—coal gas.

I take it, Sir, that our duty is to endeavour by every means to improve our chief commodity, by eliminating actual or hypothetical impurities, to cheapen still more its production, develop its manifold and latent qualifications, and popularize its use. By the adoption of this policy, the best

interests of gas proprietors will be consulted, the wants of the public served, and the credit of our high profession maintained.

Some time since I was called upon to light up a new district, and I determined to put into operation ideas which I had matured a long time before. Not having a lamp-column that suited my taste, I sketched one. It is, as you see, a somewhat plain fluted pillar, affording no "coign of vantage" for the exploits of mischievous boys, whose special mission appears to be to do that which ought not to be done, and to leave undone the things which ought to be done. Every such "coign" is convex or bevelled off, so that no foothold is obtainable, and the sharp edges of the flutes are by no means comfortable to handle. Notwithstanding this, it is not deficient in ornament. The height from the ground-line to the centre of the flame is 11 feet, and the chief feature is the large space allowed at the top. Objecting as I do to lamps being attached at the bottom, the frame is continued upwards to receive the lamp, which is an ordinary square one, made a little longer than usual. The rate of consumption is only 5 feet per hour, and with this quantity the minimum of shadow was thrown on the pavement. The head of the lamp is certainly light, but when made of best Staveley iron it is quite strong enough to withstand any gale. The entire weight is 3¼ cwt. The average distance of the lamps apart was 83 yards, and the success of lighting was so great that the residents in the older parts of my district complained that I had bestowed special favours upon the Newbold Local Board, and lighted up their district more efficiently than any other. The fact of the glass being new, and care having been exercised in its selection, increased considerably the radiant effect produced. From what I have said respecting the interception of light by various kinds of glass, you will readily admit this.

You will probably ask why the lamps are made so much longer than ordinary ones. You will perceive the angles of the frame are continued till they meet. In experimenting with lanterns, I conceived the theory that if the edges of the flame were broader than the base of the lamp, the shadow would be destroyed. In order to demonstrate this, the new lamp was constructed, and with a bat's-wing flame it gives no shadow; but a lamp that length is inconvenient in some respects, and by shortening it by degrees, I finally determined upon a suitable shape. To ensure steadiness of flame, I adopted means for the regulation of air at the bottom of the lamp, and the result is satisfactory in every way. I would strongly advise all gas managers to adopt this form of lamp, which will fit the ordinary 14-inch frame, can be made by any tinman, is easily cleaned, and will effect, at a trifling cost, a great improvement in street illumination. It measures 6 inches at the bottom, 14 inches at the frame; its lower part is 2 feet long, and the roof 7 inches high, exclusive of windguard.

The powers possessed by local authorities over public lighting are extensive and varied, differing greatly as between limited liability companies, non-statutory companies, those under Provisional Orders, and those incorporated by special Act of Parliament. The earliest powers of public bodies over public lighting are to be found in ancient charters, special Lighting Acts, and in the old Watching and Lighting Act of 11 Geo. IV., c. 27. This was repealed by the 3 and 4 Wm. IV., c. 90, but all the former powers and penalties are re-enacted. Coming down to later times, the 12 and 13 Vict., c. 94, clothes local boards of health with power to contract, for any period not exceeding three years at one time, with any company or persons for the supply of gas, oil, or other means of lighting the streets, roads, and other open places within their respective districts, and the expenses may be defrayed out of the general district rates levied under the said Public Health Act. The Legislature appear to have had some misgivings respecting the honesty of the ancient purveyors of artificial light, and also of gas undertakings, and they inserted in these general Acts very stringent clauses for the protection of the consumer and the punishment of the contractor or the company. Illustrating as it does the fidelity with which gas companies fulfil their legal obligations, these penal clauses are very rarely put into active operation, the companies being so seldom in default.

In 1847 the Gas-Works Clauses Act, or the 10 Vict., c. 15, was passed, and in 1859 Lord Redesdale brought in a Bill to secure a legal standard in the measurement of gas, and the Sales of Gas Act, 1859, and the Sales of Gas Amendment Act, 1860—most useful Acts—were passed. In 1870 the Gas and Water Works Facilities Act became law. A year later, the Gas-Works Clauses Act, 1871, was passed. The Act of 1870 does not concern us at present, containing no enactment respecting public lighting. The 1859 and 1860 Acts refer to measurements of gas and its machinery for inspection, and, for a like reason, we may disregard them in this paper. The Acts of 1847 and 1871, however, are directed to be construed together as one Act, and the Act of 1871 repeals and supersedes such of the provisions of the first-named Act "as are inconsistent" with the latter. Section 24 of the 34 and 35 Vict., c. 41, practically hands over the control of the public lighting to the local authorities.

The Special Act or Provisional Order usually specifies the price of gas for public purposes, or the uses to which it may be applied and paid for out of the rates, and it has been the practice to make a reduction in favour of public lamps. Remembering that all ratepayers enjoy equally the benefits conferred by public lighting, and a large proportion of ratepayers are not private consumers of gas in any way, I cannot subscribe to the unjust principle of selling gas to the *quasi*-consumer at a lower rate than to the private and public consumer. That the buyer of the smallest quantity should be placed on better terms than the buyer of the largest quantity, is an anomaly difficult to reconcile with commercial principles; but this is so whenever gas is supplied to public lamps at a reduced rate per 1000 cubic feet.

It is obvious that the ratepayer who only pays through his rates for gas supplied to the public lamps, obtains such gas on easier terms than the one who happens to be also a private consumer. Thus, assuming gas for public purposes to be sold at 2s. 6d. per 1000 cubic feet, and for general purposes at 5s., it follows that A., who is only a ratepayer consuming his share of gas *viâ* the public lamps, obtains his gas for 2s. 6d. per 1000; while B., being a large private consumer as well, has to pay an increased rate for his private consumption. So much money being required for paying the dividends of a company say, the larger proportion is contributed by the private consumer, and I am driven to the conclusion—and I am glad to be in a position to state that I am supported in that conclusion by many friends—that, to be equitable in price, no reduction should be made in favour of the public lighting. Another point worth remembering is that in many districts public lights are used for only four, six, or eight months of the year; whereas a private consumer is a constant customer, using gas all the year round, not even extinguishing on moonlight nights.

Of the average meter system I shall say but little. The framers of the 25th section of the Gas-Works Clauses Act, 1871, were evidently neither engineers nor gas managers, or they would have put all the public lamps on meters direct, or at least have settled how many lamps were to be metered or unmetered. Whether they wished 1 per cent. or 50 per cent. of the lamps to have meters attached, they hesitate to inform us, and very graciously leave the parties interested to fight it out among themselves. As far as I have been able to learn, this "average meter indication" system is a delusion; it has been tried and abandoned. Important economical results have been reported from time to time as due to its adoption; but I venture to think that such economy is due, not to the supposed check by a meter to so many lamps, but to the shortening of the hours of burning by the local authorities. With fair and open dealings between the officials of local authorities and the officers of gas companies, with confidence in men's honour and doing to others as you wish them to do unto you, the "average meter" system is utterly unnecessary, and the absence of its general adoption must be taken as a proof of its failure. If any member of this Association has the system in operation, I trust he will give us the benefit of his experience therewith, and show us the advantage conferred on the public by this system of supplying and charging for gas to public lamps.

Having now, Sir, discharged my duty and fulfilled my promise, I must ask forgiveness for the many imperfections to be found in this paper, and for the defective manner in which the subject has been laid before you. Considered with regard either to its importance, its interest, or to its possible operation on the future of gas companies, no excuse is needed for its introduction to your notice to-day; and I venture to hope, Sir, when you invite discussion, as you will do directly, upon the substance of this paper, that any member of this Association who hesitates to accept its tenor as correct, or who disagrees with the conclusions arrived at by the author, will avail himself of this opportunity, and express his views with earnestness, with thoroughness, and with force, in order that by the mutual interchange of ideas we may be assisted to establish scientific truth, increase more and more the value of our Association, and cement more closely our common bond of fellowship.

Mr. Leyton (Redditch) said he did not quite catch whether Mr. Jones was in favour of the average meter system or of lighting by contract. His own experience had caused him to be in favour of the former, but he thought the meter lamps, instead of being one in ten, as was usually the case, should not be less than one in five.

Mr. Stevenson (Peterborough) said all present must feel the importance of the subject dealt with in the paper, and must admire the elaborate manner in which Mr. Jones had put it before them. As regarded the lighting of public lamps, it must be remembered that managers were very much tied down, especially those of them who managed for companies, by the fact that they were simply supplying customers with an article of which those customers might take any quantity they chose to pay for. So that, as regarded the improvement of the public lighting of any town, it depended very little upon them as managers, unless they could induce corporations or companies to put their hands into their pockets more freely than they generally were disposed to do. Those of them who were managing gas-works for corporations had a greater hope of success than those who were managing for companies. Notwithstanding that, he did not think any of them should be cast down, but should make every effort to improve matters. They should aim less at getting very large lights introduced than at increasing the number of lamps, although the former were very well as an experiment just now, as a set-off against the electric light. He thought of putting up one of these large lights in the market-place at Peterborough, when his Shareholders were very much frightened about the electric light, but they were not able to obtain one just at the time, and later on, when the "scare" was over, they did not deem it worth while to go to the expense, the price of the big lanterns being excessively high. So much so, that unless there was some very large gain to be derived in reassuring the public or the shareholders, it was not worth while to incur the necessary expenditure. The more important thing for them to do, however, was to induce corporations to put up more lamps, consuming 5 or 6 cubic feet of gas an hour, which he agreed was the desirable quantity. Then the lamps ought to be nearer together than was generally the case. Another evil was putting out the lamps in the summer months, and during the rest of the year on what were called moonlight nights. It was so in Peterborough. The Corporation there were not very rich, and felt they had enough to do to pay for the gas they used. But he thought this was because they did not attach sufficient importance to the lighting of the town, and lost sight of the saving that might be effected in other directions by means of better lighting. On the Continent, most of the large towns were better lighted than the English ones, not because the lights were larger, but because there were more of them and they were closer together—40 or 50 yards being the usual distance, as against 60, or even 70 yards in England. If they could induce corporations and ratepayers to see the importance of this, gas managers could do all that was desired. He did not know that there was any necessity to remark on the designs of lamps which Mr. Jones had put before them; but the question of the quality of the glass did seem to him to be very important, and he was astonished to find that the inferior qualities diminished the light so much. Coloured glass was not introduced into lamps used for lighting purposes, but into those used to draw attention to some particular kind of shop. As to the matter of the average meter system, he had had no experience with it, his Company having always sold gas by the 1000 feet, and charged for so many hours and so many lamps at 5 cubic feet per hour, and the system had worked satisfactorily. They used Sugg's governors, and were now fitting up some lamps with Borrowdale's metallic governors. He did not know that it was of much moment if a little shadow was thrown down just below the lamp; but if that was deemed important, it would be easy to bring the lantern to a point. Sugg's lantern concentrated the light too much around the lamp, whereas their aim should be to diffuse the light; and he had for some time had an idea that for this purpose the top of the lantern should be of a semi-circular form, so that the rays of light striking the top portion should be reflected outwards, and thus be made available for illuminating the ground beyond. As it was, almost all the upward rays were lost, except in the case of the opal top, which threw some portion of the light down. A semi-circular top would, however, not be easy to replace in the event of breakage.

Mr. North (Stourbridge) said he could corroborate to a great extent what Mr. Stevenson had said as to the difficulty of inducing corporations or commissioners to increase the number of lamps in streets when they were really needed. He found the tendency was towards a reduction of the number. In putting up lamps in a new district a short time ago, the authorities decided to place them about a hundred yards apart; consequently the street was not properly lighted. The Gas Company were blamed, though in no way responsible for the lamps being so placed. He did not know whether Mr. Jones would throw the blame on gas companies for not supplying better lighting appliances; but he thought some companies were so situated that they could not afford to spend money on fancy lamps and columns. For instance, his Company were supplying the Authorities under a special Act, which gave them 40s. per lamp for 2400 hours lighting, the Company finding everything connected with supply, lighting, cleaning, &c., which left them with a loss of from 9s. to 10s. per lamp. That, he thought, would justify companies in refraining from any extra expenditure on columns, &c. He was using the same pattern column as Mr. Jones had shown them, which was a cheap one, but as good as they could afford. As regarded regulators, he was inclined to favour the metallic ones with the lava bat. With respect to the large burners which had been referred to

and explained by Mr. Jones, he had not had the pleasure of seeing them, but could imagine them to be very effective in some places and under certain circumstances, but for general application he thought that instead of replacing one 5-feet burner by a 7-feet one, an extra lamp here and there would be more efficient. Some time previously he had about three years experience in the working of the average meter system, and found that under it the Authorities were satisfied, and the Company were paid for what gas they supplied to the lamps, which was not always the case under contracts. One meter to every 12 lamps he would take to be fair, and he thought the system would put an end to all quibbling between local authorities and gas companies. As to lamps not being lighted during the so-called moonlight nights, which were frequently as dark as other nights, he thought the plan very objectionable. The authorities said they wished to avoid a higher rate, but he felt confident that the ratepayers would not object to such a small addition to the rates for the advantage gained. Personally he should have liked the much-discussed question of price for supply, &c., to public lamps by contract to have been gone into more fully, but time would not permit. Like Mr. Stevenson, he was astonished at Mr. Jones's figures showing so great a loss of light through the using of inferior glass.

Mr. Petey (Burslem) gave the results of his experience of Sugg's and Borrowdale's burners and regulators, and asked for a little more explanation of the Wigham burner.

Mr. Winstanley (Newcastle) said he was improving the lamps under his control by having opal tops placed to them, and the improvement was very great, whilst the cost was only about 9d. per foot. They also found that the lamps were greatly improved by the use of the duplex burner. He had recently fixed one of Hulett's YM lamps with a duplex flame, which gave a far superior light to the ordinary ones; in fact, one of these burners gave an illuminating power of 13·68 standard candles per 5 feet of gas, as against 10·54 standard candles of the ordinary flat-flame. His lamps ranged from 60 to 100 yards apart, and the Company were grumbled at for not giving more light; but, of course, it was not their fault, but the fault of the Corporation, for not having more lamps. With regard to the electric light, he saw by that morning's paper that Dr. Siemens had stated in his evidence before the Committee of the House of Commons that the cost of lighting the Albert Hall by electricity was only £1 7s. 6d. per night, whereas gas lighting cost £4 7s. 6d. per night. This was not in accordance with the experiments tried elsewhere, where the cost of the electric light was given as seven times that of gas. Dr. Siemens's statement was rather startling.

The President: Startling, if true.

Mr. Tindall (Walsall) said the interesting and instructive paper they had listened to presented itself to his mind in three aspects, in reference to public lighting—first, by the electric light; second, with large lamps; and third, with the ordinary lamps. From what he could learn, he thought the electric light would not take the place of gas for the lighting of large open spaces and squares, but that such places could be lighted better and more cheaply with gas than with the electric light. He also thought one of the improved gas-lamps would be better than a cluster of three or four lamps on one column. With reference to the ordinary lighting, which was very important, he thought a back street should be as well lighted as a front one; for if a thief was going to attempt to rob a house he took a plan of the back and not one of the front; and it was in the back streets where property was in danger and the light most wanted. The back streets, however, could only be well lighted by improving the ordinary lamps, and on this topic Mr. Jones had thrown out some good hints. One of these was that no service-pipe should be less than ¾-inch diameter. Another was that open bends should be used instead of square elbows, and another was causing good glass to be used, a good deal of light being lost by putting in bad glass. The next thing was to have as good a burner and governor as possible. He had used Borrowdale's, and liked it very well. The conclusion at which he had arrived was that if they could apply themselves to improving the ordinary lighting, the time and attention they had given to this subject would not be thrown away, but would be of benefit to gas companies, corporations, and the public at large.

Mr. J. Annan (Wolverhampton) said he felt greatly indebted to Mr. Jones for the interesting and lucid paper he had read, but he should like to have heard something of the difficulties of street lighting, and of the manner in which gas managers should generally conduct that kind of lighting. In 1864 his Directors agreed with the Corporation to put meters to a certain number of lamps, and Sugg's 4 feet per hour regulators to every lamp, since which time the regulators, as a rule, had acted very well. But it did not do to put them aside during the summer; he found it necessary to take them all to pieces, oil and test them. Some regulators had been in use 14 years, and were still working well; others had only lasted two years, but he thought they had been scorched, owing to the burners being placed too close to the regulators. There could be no question as to the importance of street lighting being well attended to, it being desirable to show in every possible way the value of gas as a lighting agent.

Mr. Simpson (Rugby) said he represented one of those little towns that had all the difficulties in dealing with local boards that had been spoken of. He was of Mr. North's opinion, that it was not true that the ratepayers would refuse to pay the extra rates necessary for better lighting. Mr. Jones had given them a great deal of information as to shadows about the lamps, but where the lamps were of the old-fashioned type, with four squares in the bottom, and large cast-iron brackets on the top of the posts to fasten the lamps to, and all the property of and repaired by the town, it was rather difficult to persuade the authorities to expend, say, 15s. per lamp to alter them so that they could be lighted with the rod, and the price paid for gas for the lamps would not allow the gas company to make such alterations, so they had to go on in the old way. He agreed with what had been said as to the importance of keeping the lamps clean. It was a great comfort to the gas manager to see a clean bright lamp. The burners used in the lamps at the railway station were very small. It had frequently been observed by consumers that the lamps in the town gave much more light than those at the station, which helped the Manager to explain that a good light could be had from the gas when the pipes were clean and the burners good. The Authorities had not fixed regulators on the lamps, but to prevent the rush of gas to the burners he passed the gas first through a No. 3 Bray's fishtail, fixed on a cone slipped into the pipe, before it reached the tap, and then a No. 4 Bray's bat's-wing in the proper place for the burner. This very much reduced the rush of gas to the burner proper, but by no means regulated the quantity of gas, as he was trying five lamps with meters, and found that the consumption varied from 7·41 to 4·91 feet per hour. He was now about to try a No. 2 fishtail in place of the No. 3.

Mr. Stevenson said he found that out of 500 Sugg's governors he had in use, not more than 20 or 30 required to be repaired yearly. When he went to Peterborough he had the lamps altered to make them available for lighting by means of poles, but he had not found much saving from this. Each man lighted 80 lamps. Before the alteration, the lamplighters required an hour to light the lamps, and after the alteration they did it in from 10 to 15 minutes less.

Mr. Jones said the general concurrence of opinion in the views expressed in his paper was very gratifying to him. Mr. Layton had spoken of the average meter system as a success in his case. That was the first instance of the kind that had ever come to his (Mr. Jones's) personal knowledge, and he thought that if Mr. Layton were to try a good regulator he would be able to maintain his consumption better than he did with the average meter system. The variations in regulators were, of course, due to mechanical defects in their construction, and the variations of pressure in the mains. When a regulator was so constructed as to have a small range of regulation, and was adjusted at a low pressure, the gas at high pressure simply blew through, because they had exceeded the regulating and governing power of the instrument. He agreed with Mr. Stevenson that gas managers were tied down by the local authorities. As he had shown in the last part of the paper, devoted to the legal aspects of the subject, the managers had no great latitude to improve public lighting, but they could certainly (most of them, at any rate—he hoped all of them) induce their directors and committees to lead the way to influence the authorities to show the public, who elect those in authority, that great improvements might be made at trifling cost. The experiments he had made himself were by no means costly, and already they had led to an increased consumption of gas. He made some rough experiments when he saw the light in Sheffield, and he found that he could read ordinary newspaper print at 22 yards distance with Sugg's 200-light burner, and at 12 yards distance with the 80-light burner; whereas with the Wigham light, which was placed too high, he could read the same size print at 44 yards distance, and with the Wigham at Chesterfield, 14 feet 6 inches high, he could read small newspaper print at 37 yards, and the smallest type used in newspapers at 35 yards. He could also see the seconds hand of his watch at a distance of 50 yards. The consumption of gas was 60 cubic feet per hour. That was what Sugg's burners would not do. He did not consider that Sugg's burners were applicable to street-lamps, for the reason that the glass was very liable to be broken, and they required far too much attention. Furthermore, the lamps were ugly, and he thought the corners could be dispensed with, and that was something in 100 or 1000 lamps. His experience convinced him that for ordinary lighting purposes nothing could be better than the square lamp. He could not agree with the remark that the shadow on the pavement was not a matter of great importance. He thought it was, and when they found people taking refuge in the shadow it did not reflect credit on the parties responsible for it. He did not like the opal tops; he thought the light should be diffused and not concentrated; and the great fault of Sugg's lanterns was that the light was confined to a limited area instead of being sent out in all directions. He quite sympathized with Mr. North in the loss of 9s. per lamp, and he should think there were some special reasons why that was submitted to.

Mr. North: Because we cannot get out of it.

Mr. Jones: Where the price was regulated by special Act, they could not get out of it, except in this way: Charge for the gas at the statutory price, and then charge for "services rendered" in addition. He thought that would help Mr. North. A man was not bound to supply labour on losing terms, whatever might be the case with the gas. Very useful as the large lights were, he never intended to imply that they were to be fixed universally in the place of the existing lights. Strong lights might be very desirable in some situations, but in others smaller lights would satisfy the public requirements. In that case, he thought it very desirable to depart from the hard-and-fast line of so many cubic feet to each burner. A uniform rate of consumption all over a town like Birmingham, for instance, was certainly a mistake. There were many places, like corners of streets, that should have a stronger light than the middle of the street. There was a good deal to be done in the arrangements for the lighting of a town, and with lamps so far apart as from 60 to 105 yards, a strong light was required to light up the intervening spaces. As regarded the average meter system, where it satisfied the commissioners it was a considerable gain. The moonlight night practice was one that should be discouraged; but managers were almost powerless in the matter. In his district, within the borough limits the lamps were burning every night all the year round. In other parts of the district they were extinguished six months in the year, and five nights of the moon—two before and two after the full moon. Last winter one of the local boards had the lamps put out as usual when the moon was in the heavens; but a storm came on, it was very dark, and, being Sunday night, large numbers of people were on their way to places of worship. A poor woman was stepping off the footpath and fell into about 5 inches of sludge, and there was a talk of bringing an action against the Board for damages. He did not know how far such an action would lie, but it showed the bad results of putting the public lights out. This was not the only accident he had known. As to the alleged indisposition of ratepayers to pay for street lighting, it was generally some individuals of the governing bodies who opposed, and they would find men of that class in all parts of the country—men who said that when they were young there were no lights at all, and they did not see why they should be called upon to pay for lighting now. But that class was dying out, and a new generation was coming up, disposed to pay for lighting if they were only shown how to use it effectively. As to regulators, he could not conceive of such a thing unless it had motion, and any fixed contraction of the orifice through which the gas had to pass was not regulation. With regard to the Wigham burner, it had 28 jets of the ordinary size, which were fixed in little brass tubes, about 6 inches long, all standing up in a circle, and surrounded by a brass cone. When the light was turned on, with or without the cone, there was a large flame of fire. It burned very yellow, and deposited its carbon freely. The inventor attached an iron chimney, about 2 feet long, which was put over the burner, and inside the lamp, at the bottom of the iron cylinder, was a cylinder, or, as it was called, a disc of talc. All the air was admitted at the top and none at the bottom, and the motion of the air would produce a strong upward current through the chimney, and owing to the larger area in the lamp, slower converging currents to the burner. By putting a cylinder over the large light, the effect was to create this upward draught, which would draw down the air to the light, and take it into the cone which exhausted the oxygen in the upper portion of the flame, and the result of that was a splendid mass of intense light. Then the escaping gas was dealt with by the flame, and was consumed inside the talc cylinder. It was important that this cylinder should be exactly over the flame. The lamps were rather difficult to light, all the air being admitted at the top; but there was a little bye-piece on the cock, which kept a small light during the day, and which might be turned on full at night. He did away with the opal tops, and the effect, to his mind, was better, there being greater diffusive power. With regard to the paragraph from the paper as to Dr. Siemens's evidence, he did not think that the figures given could be sufficiently relied on as data, there always being danger in taking scientific knowledge from daily newspaper reports, and he did not think the statement need be replied to until they saw whether it was corroborated. Giroud's rheometers he was rather in favour of, the only objection to them being that a greatly increased pressure would blow the glycerine out of the cup. Perhaps 17-10ths would do it.

Mr. Petey: I have used 28-10ths, and they have stood that.

Mr. Jones: Well, a good deal would depend upon the specific gravity of the glycerine, which might vary in the two cases. As to the effect

of the public lamps upon the public mind, there was an interesting feature there which was not entirely sentimental. Increased brightness gave cheerfulness to the mind, and if a manager had a good light in his street-lamps, he had a standard of excellence to which he could refer a grumbling consumer, whose bad light was perhaps due to bad fittings or bad burners. As to the cost of altering the lamps, referred to by Mr. Simpson, if that gentleman would undertake the alteration, he would have quite 15s. worth of satisfaction. The variations disclosed by Mr. Simpson's meter experiment were very extraordinary, and pointed to the need of more attention to burners. As to the system of lighting with the pole, his men lighted 105 lamps each. Mr. Simpson's figures showed that in his case the men got over about four miles an hour, which was not a great speed for a lamplighter; and if the ladder were abolished, and poles substituted, it would be found that there would be a great saving in time alone.

The PRESIDENT said that the discussion upon the paper had been eminently satisfactory. There was one thing upon which they all seemed to be agreed, and that was that more attention should, in the future, be paid to street lighting, either by local authorities or by themselves. but probably it should be shared between them. As it was, companies could do little or nothing; they could only show what might be done, and it was for the lighting authorities to take up and apply what they (the managers) put before them. It was a question whether the improved lighting should be obtained by the existing system, or by the adoption of the large burners, which might be said to have been brought into existence by the recent "scare." They could hardly suppose that the large burners were likely to be generally adopted. It could never be that large light-centres were more economical than a great number of smaller jets. Probably too much stress had been laid upon the desirability of producing a perfectly shadowless lamp. Perfection in this respect was hardly needed. They wanted it shadowless, perhaps, but they also wanted a greater diffusion of light, and a more perfect illumination. Any one who had seen the illumination in Queen Victoria Street, London, must be pleased with it; but the effect in the daytime was far from pleasant. Improvements in the shape of the lamp were greatly needed. They wanted to get the greatest amount of efficiency, but likewise to have a satisfactory appearance in the daytime. They did not want to make it seem that they disregarded appearance altogether, because in that case it was probable that the public would for a long time to come still put up with indifferent illumination rather than disfigure the streets. So he thought if the demand for these large lights still continued, they should try to improve the lanterns in appearance as well as in efficiency. But, putting aside the question of the large burners altogether, there could be no doubt that a very considerable improvement might be effected upon the ordinary system. Mr. Woodall had shown in the Waterloo Road what could be done in that direction. He did not know how Mr. Jones had arrived at the conclusion that 11 feet was the proper height of the flame from the pavement. That he thought must be governed by the intensity of the light itself. Those of Mr. Woodall's lamps were 9 ft. 6 in.; but he thought they would be improved if they were put up about another 6 inches. Objection had been taken to the average meter system; but he was much surprised that there should be any doubt upon the point. So far as his experience went, wherever it had had a fair chance it had worked well. It had prevailed in Birmingham for many years, and had given satisfaction on all sides, having averted disputes between the Local Authorities and the Company. No regulator, however excellent, could be depended upon entirely. It had almost become the fashion to abuse the leather diaphragm regulators; but it was not so many years since they were considered all that could be desired. However excellent the new regulators might appear, they must not lose sight of the fact that in the case of the leather diaphragm they had many years experience, but that in the other cases they had only a very limited experience. He would advise them, therefore, not to abandon one thing too easily, and go to another. Mr. Jones deserved their thanks for having drawn attention to the very important matter of the effect of the different qualities of glass on the emission of light. He had not supposed that there was such a difference between the qualities of clear glass; but he had made experiments with coloured and with opal glass, and found that they differed very much. With regard to the service-pipes, Mr. Jones had touched upon a very important matter. In Birmingham they had had something to do with services during the last few years, and he found that it was the ½-inch and ¾-inch pipes that were mostly subject to corrosion. Now he made a point of using steam-pipe for all sizes below one inch, because he found it was the thin pipes that corroded most readily, and he had them all laid in troughs in tar and sawdust. In conclusion, he would move that the best thanks of the meeting be given to Mr. Jones for his valuable paper.

Mr. ANNAN seconded the proposition, which was unanimously agreed to.

Mr. JONES briefly responded.

Mr. NORTH proposed, and Mr. ANNAN seconded, a vote of thanks to the President, which was also unanimously and cordially adopted.

The PRESIDENT, in responding, said it gave him great pleasure to preside at those meetings, and he hoped they would always be as successful as they had been up to that time.

The proceedings then closed.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

For the better classes of round coal there has been a general falling off in the demand during the past week, and the pits are not so well employed as they were. For round coals suitable for gas-making purposes there is, however, a considerable amount of inquiry, although this does not as yet lead to very much business, buyers apparently being not at all in a hurry to place their contracts. Very low tenders continue to be sent in, and good qualities of Lancashire screened gas coal for delivery over 12 months can be readily bought at about 6s. per ton at the pit. Common round coals for steam and iron-making purposes continue as bad to sell as ever, and engine classes of fuel, although there is now less slack being produced, show no improvement, supplies being still abundant in the market, and prices extremely low. It is difficult to quote any fixed price at which coal can be bought, as there is so much low selling where holders are anxious to get rid of stocks, and buyers who can come into the market for large quantities for cash can pretty well command their own price. The average quotations at the pit mouth may, however, be given about as under:—The better qualities of Wigan Arley for house-fire purposes, 8s. 6d. to 9s. per ton, with inferior sorts ranging about 6s. 6d. to 7s. per ton; Pemberton four-feet, 6s. 3d. to 7s., and common house coal, 5s. 6d. to 6s. per ton; screened Arley coal for gas purposes, 6s. 6d. to 7s.; Arley gas nuts, about 5s. 9d., and Wigan four and five feet screened gas coals, 5s. 6d. to 6s. per ton; steam and forge coal, 4s. 6d. to 5s.; good burgy, 4s. to 4s. 3d.; good slack, 3s. to 3s. 6d., with common sorts ranging about 2s. per ton.

The shipping trade is generally only dull, and prices are very low.

In the iron trade the amount of business doing is still extremely small, and in most cases so low as to leave no margin whatever for profit. Lancashire makers of pig iron, now that there is a prospect of north country iron again competing in this market, are finding orders more difficult to secure. For Lancashire pig iron delivered into Manchester the quoted prices are now 45s. per ton for No. 3 foundry, and 44s. 6d. for No. 4 forge, less 2½ per cent. The finished iron trade is still without material change so far as prices are concerned; but as makers generally are very short of orders, anything like good specifications are competed for at very low figures. The quotations for Lancashire bars delivered into the Manchester district remain at about £5 10s. to £5 15s. per ton.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The Durham gas collieries are at full work again. By yesterday (Monday) the outputs would be equal to the ordinary average of the most flourishing times. There is much activity at the shipping places. The ordinary colliery steamers trading between the Tyne Dock, London, Hamburg, and the large ports of the North of France are making their first voyages. There is very great pressure for early loading. Coals are hard to be had. Shipping terms are lengthy. Several short contracts for gas coals were made last week. There has been an advance in the price paid in the open market. It shows a rise of from 3d. to 6d. per ton. The pitmen are working steadily. There are no local disputes. There is likely to be an active demand for gas coals over the summer. A continental gas-works, which allowed their stocks to run down during the strike, are arranging for extra shipments, so as to be able to make up the deficiency as rapidly as possible. A number of steamers were engaged last week to load gas coals on the Tyne for St. Petersburg, Riga, and some of the other Baltic ports. The shipments are not likely to be so great to the Italian and Adriatic ports. Business is very brisk throughout the steam coal district of Northumberland. Best steam coals from the Northumberland district are being loaded on board large sailing vessels at the Northumberland Dock for Bombay, Calcutta, and the East. The men are working very steadily throughout the entire mining district of the North of England.

There is an abundance of steam tonnage in the coal ports available for trade. A good deal was taken up last week for the Baltic, but the freight market was less strong at the close than at the beginning of the week. There is very little coasting business doing. There has hardly been an order for London in the market over the week, either for steamers or sailing vessels. Steamers are paid above 4s., and sailing ships a trifle less than 5s. a ton to carry coals to London. The same low freights prevail in the gas coal trade to Poole, Plymouth, Southampton, and the French and Irish ports. Cargoes of gas coals are being sent out to Sweden, Denmark, and Norway.

The general manufacturing trade of the North of England was busier last week. There was a better demand for chemicals. Some large sales took place, and prices improved a little. There have been seasonable shipments of fire-clay goods. The failures in the Middlesbrough iron district have not extended. As a good few furnaces will be stopped through these failures, there has been a slight advance in the value of pig iron.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

It is confidently expected that the Dundee Gas Commissioners will be in a position to effect a reduction in the price of gas for the ensuing year to the extent of 2d. or 3d. per 1000 cubic feet. Unless something quite unexpected turns up elsewhere in the way of a lowering of the price of gas, Dundee will stand in the very enviable position of having the lowest priced gas in Scotland.

The annual general meeting of the Stonehaven Gaslight Company was held on Monday, the 19th inst.—Mr. Alexander Weir, Chairman, presiding. It was shown by the report which was submitted on behalf of the Directors that the year's transactions had resulted in a balance of £470 9s. 6d., subject to a deduction of 2½ per cent. on account of depreciation of plant; and it was agreed to pay the Shareholders a dividend of 2s. per share. The Directors for the ensuing year were then appointed.

It is proposed to hold an exhibition of gas apparatus in the Watt Museum, Greenock, in September next, and the preliminary arrangements are now being made for carrying out the proposal. At last Tuesday's meeting of the Police Board, the Gas Committee minutes stated that a special meeting had been held to consider an application from the Watt Museum Committee for a supply of gas, free of charge, and the Gas Committee, out of consideration that exhibitions such as that proposed were calculated to bring about an increased consumption of gas for heating, cooking, and driving purposes, unanimously resolved to grant a free supply to the extent of £30. The Police Board approved of this, and the following members of the Gas Committee agreed to co-operate with the Museum Committee in promoting the scheme:—Provost Lyle, Treasurer Leitch, Councillor Orr, and Commissioner Shaw. This is the first regularly organized attempt at getting up a gas apparatus exhibition in Scotland; but it has for a number of years been almost the invariable practice of the Associations of Gas Managers to have the interest of their yearly or half-yearly meetings enhanced by the exhibition of more or less important novelties in the shape of apparatus connected with the manufacture, purification, distribution, and consumption of gas.

Notwithstanding the fact that a number of months have passed since Dr. Anderson Kirkwood's decision was given in the arbitration case, consequent upon the resolution of the Police Commissioners of the Burgh of Johnstone to take over the gas supply of the town, under the provisions of the Burghs Gas Supply (Scotland) Act, the works are still being carried on by the Gas Company; and it is not known when the actual transference of the same to the Municipal Authorities will take place. It is reported, however, that they are waiting until they can secure the loan of the required sum of money at the lowest possible rate of interest. There is every probability that they will have to raise at least £2250, in order to pay the price awarded by the overman, together with the expenses already incurred. So soon as the transference does take place, it will be necessary to increase both the making and the storing power, and otherwise to improve the works. There is room to believe at present that the Johnstone arbitration case will not add to the popularity of the Anstruther Gas Act.

Preliminary operations for the construction of the Inverkeithing public water-works have been commenced. The pipe track will be 6 miles in length from the point at which the water is delivered by the Dunfermline Water Commissioners, and arrangements for acquiring the necessary land are being carried out satisfactorily. Mr. John Buchanan, C.E., Edinburgh, has prepared the plans.

It seems that the new reservoir in connection with the Ayr Water-Works is far from being in a satisfactory condition. There was a slip in it last November, the repairing of which cost between £300 and £400; and it is thought that an expenditure of some £800 or £1000 may yet be required to make the reservoir safe at the place where the slip occurred. The Provost and some other members of the Town Council have been desirous of having the professional services of Mr. James Wilson, C.E., Greenock, to examine and give advice on the engineering difficulty which has arisen; but in the meantime it has been resolved to have the repairs executed under the responsibility of the Water Committee by the Surveyor.

New water-works, in conformity with plans prepared by Mr. James Wilson, C.E., Greenock, are to be commenced for the important manufacturing village of Alexandria, in the Vale of Leven.

An ample supply of water having been obtained by the Water Commissioners of Irvine for the wants of that town, with abundance to spare, the Local Authority of Kilwinning have for some time been negotiating for a supply from them. But the two parties cannot agree as to the price which should be paid for the water. Irvine is not willing to give the desired supply at less than 4d. per 1000 gals., no matter what quantity of water may be taken; and Kilwinning thinks that 3½d. per 1000 gals., with a discount if the consumption exceed a certain quantity, is quite sufficient. In the meantime there is a deadlock, as the Irvine offer is understood to be final.

It is estimated that the proposed drainage scheme, Port George Street district, Paisley, will cost about £10,000, in addition to a yearly expense of £200 for maintenance of the same.

Last week's Glasgow pig iron market was quiet and drooping, and only a small amount of business was done. As low as 42s. 2d. cash was accepted on Wednesday, and on Friday business was done at 42s. 3½d. to 42s. 4d. cash, and 42s. 6½d. one month.

The coal trade is still in a very unsatisfactory condition throughout Lanarkshire and the adjoining counties. A larger amount of business is reported from Fifeshire and other mining districts in the East of Scotland.

SALE OF GAS AND WATER SHARES AT WEST HARTLEPOOL.—Last Thursday there was a public sale of shares in the Hartlepool Gas and Water Company, when 400 shares of £10 each (maximum dividend limited to 7 per cent. per annum), being part of the "gas capital" authorized by the Hartlepool Gas and Water Act, 1878, were sold. The shares are entitled to dividend from the 23rd of June next, and a deposit of 10 per cent. was required to be paid at the time of sale, the remainder on or before the 23rd day of June. Also 178 shares of £10 each (maximum dividend limited to 7 per cent. per annum) being part of the "water capital" authorized by the same Act. A deposit of 10 per cent. was to be paid at the time of sale, and the difference between that sum and £2 per share, and the premium, to be paid on or before the 23rd day of June, the remaining £8 to be paid in such calls as the Directors may hereafter determine. The shares were offered in lots of £10 each, and were rapidly disposed of, good premiums being realized upon the whole of them. The gas shares sold at the following prices:—5 at £12 12s., 5 at £12 12s. 6d., 3 at £12 13s., 13 at £12 14s., and 14 at £12 15s.; while the water shares sold—8 at £3 7s., 8 at £3 8s., 1 at £3 9s., and the odd lot of eight shares for £3 14s. each.

PRESENTATION TO MR. W. H. GILL, OF LEEDS.—A number of the officials at the Leeds Gas Office met on Monday, last week, to make a presentation to their colleague, Mr. W. Hodgson Gill, the Borough Superintendent of Gas-Meters. The testimonial consisted of an elegant copy of Dr. Mantell's celebrated work, "The Medals of Creation." The object of the presentation may be gathered from an inscription in one of the volumes, which was "A few friends, desirous of evincing to Mr. W. Hodgson Gill some expression of their esteem for him, present him with this copy of Mantell's 'Medals of Creation,' which work, although in itself a mine of geological wealth, very inadequately expresses the sincere and affectionate regard in which he is held by the subscribers."

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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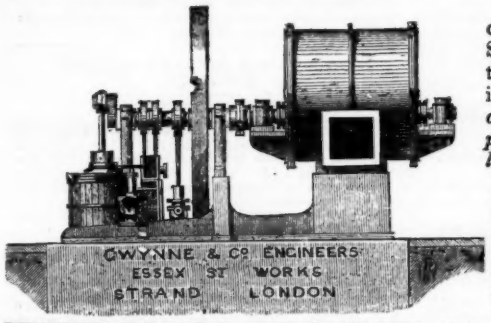
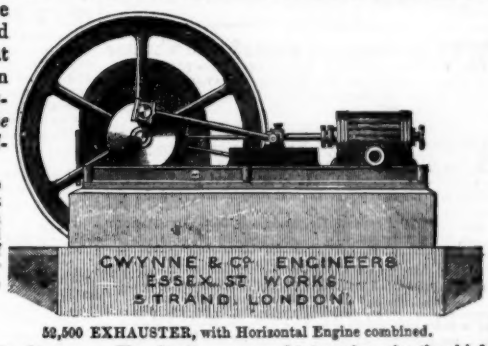


EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—*"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."*

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

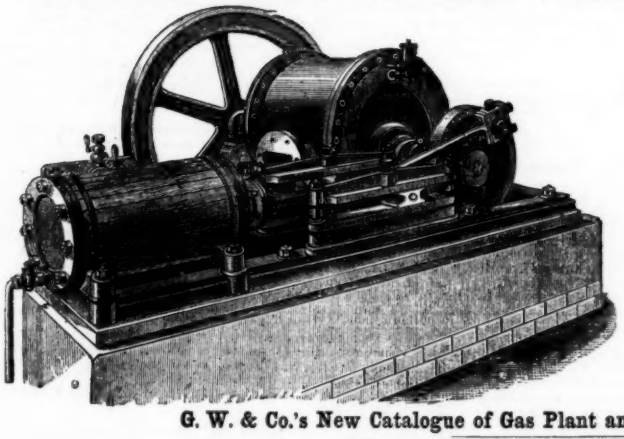
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS



WITH

Wrought-Iron Spindles and

ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

TO GAS ENGINEERS.

D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

TAY WORKS, BONNINGTON, EDINBURGH.

WANTED, Readers of the NEW Edition, 1879, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, A.I.C.E., Gas-Works, SYDENHAM, S.E.

WANTED, a small Gasholder, with Cast-Iron Tank, from 25 to 30 ft. in diameter and 10 to 12 ft. deep. Either new or second-hand.
Apply, stating particulars and lowest cash price, to Wm. DANIEL, 55, Mary Street, DUBLIN.

WANTED, an Appointment as Manager or FOREMAN of small Gas-Works. Thoroughly acquainted with the Manufacture and Distribution of Gas upon the most approved principles.
Address No. 549, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Re-engagement as Work- ing MANAGER of small Gas-Works. 18 years practical experience in the Manufacture and Distribution of Gas, Retort-Setting, Main and Service Laying, Meter Inspection, and Fitting. Good references, and satisfactory reasons for leaving last situation.
Address E. S., 3, Charlotte Street, GREENWICH.

WANTED, by a young married man, a Situation as MANAGER or MANAGER and SECRETARY of a Gas-Works where the make is about 15 or 20 million cubic feet per annum, or Assistant Manager to large Gas-Works; having a thorough practical knowledge of the Meter, Mains, and Fitting department. The highest references can be given.
Address E. T. H., 128, High Street, CHELTENHAM.
*** If the gentleman who, in answer to this advertisement, last week, sent his letter to "215, Post Office, Cheltenham," and had same returned through the Dead Letter Office, will kindly send to the above address, advertiser will get it.

METER Inspector wanted, one who has been accustomed to Repairing Meters preferred.
Apply, by letter, to Mr. BENJAMIN HAYNES, Secretary, Stretford Gas Company, near MANCHESTER.

TO GAS COMPANIES.

ADVERTISER wishes a Re-engagement as MANAGER. Make from 3 to 20 millions. Over 30 years practical experience in the general routine of the business. Eleven years in last engagement; good references.
Address E. G., care of Mr. Anderson, 35A, Great George Street, WESTMINSTER, S.W.

NEW VOLUME OF WEALE'S RUDIMENTARY SERIES.
Just published, 12mo., with numerous Illustrations, limp cloth, 4s. 6d.; cloth boards, 5s. (postage 4d.)

FUEL, its COMBUSTION & ECONOMY; an Abridgment of "A Treatise on the Combustion of Coal and the Prevention of Smoke." By C. W. WILLIAMS, A.I.C.E. With extensive Additions on Recent Practice in the Combustion and Economy of Fuel—Coal, Coke, Wood, Peat, Petroleum, &c. By D. KINNEAR CLARK, M.I.C.E.
"Students should buy the book and read it, as one of the most complete and satisfactory treatises on the combustion and economy of fuel to be had."—*Engineer.*
"The book is a valuable one, and will be found of great interest to Gas Engineers and Managers."—*Gas Trade Circular.*
CROSBY LOCKWOOD & Co., 7, Stationers' Hall Court, LONDON, E.C.

THREE Purifiers for Sale Cheap, size 8 ft. by 6 ft. by 4 ft.; lids equal to new. Also Dry Centre-Valve and Connections for same, 6-inch.
Apply to J. S. CRANMER, Gas-Works, STRATFORD-UPON-AVON.

GOVERNOR FOR SALE.

THE Shanklin Gas Company, Limited, have FOR DISPOSAL a nearly new 8-in. Air Vessel Concentric GOVERNOR, with six Ornamental Pillars, 8-in. Four-way Bye-pass Cock with Connections. Makers, Messrs. W. and B. Cowan. To be moved to make room for extensions.
Can be seen and particulars obtained on application to W. SUTHERLAND, Secretary.

EXHAUSTER FOR SALE.

FOR SALE, an Engine and Exhauster combined, to pass 7000 feet per hour, together with Boiler, 12 ft. by 4 ft., Boiler Fittings, Connections, Regulator, and Stone Bed.
For particulars, apply to W. T. TEW, Gas-Works, WARWICK.

PURIFIERS FOR SALE.

FOR SALE, price £60.—The Plates forming a Set of Two Purifiers, 12 ft. by 4 ft. 6 in. by 4 ft. deep, together with wrought-iron Covers, Lifting Tackle, Wood Sieves, Hydraulic Valve, and Connections The above are all equal to new, and very handy, requiring little floor space.
Apply to the MANAGER, Gas-Works, STONEHAVEN, N.B.

TO BE SOLD, Cheap, Three Telescopic GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield.
For price, apply to THOMAS PIGGOTT AND Co., Spring Hill, BIRMINGHAM.

COAL TAR.

TO BE LET, from July 1st next, for One, Three, or Five years, as may be agreed upon, the whole of the COAL TAR (about 300,000 gallons per annum) produced at the Works of the Sunderland Gas Company.
Tenders, endorsed "Tender for Coal Tar," will be received until Tuesday, the 17th day of June.
Further particulars may be known on application to
JOHN H. COX, Secretary.
Sunderland, May 20, 1879.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)

The HALF-YEARLY ORDINARY MEETING of the Imperial Continental Gas Association was held at the City Terminus Hotel, Cannon Street, London, on Monday, the 26th inst.,

SIR JULIAN GOLDSMID, Bart., M.P., Chairman,

When the following resolutions were passed:—
Resolved unanimously—"That the Report upon the affairs of the Association now read, be received, adopted, and entered on the minutes."
Resolved unanimously—"That a dividend of £5 per cent. be declared upon the £2,800,000 capital stock of the Association for the half year ended the 31st of December last, and a bonus of £1 per cent., and that the said dividend and bonus be payable, free of income-tax, on and after the 14th of June next."
Resolved unanimously—
"That Clarence Pigou, Esq., be re-elected a Director of the Association."
"That Henry Wood, Esq., be re-elected a Director of the Association."
"That John Horsley Palmer, Esq., be re-elected a Director of the Association."
"That Joseph Sebag, Esq., be re-elected an Auditor of the Association."
"That the cordial thanks of the meeting be given to the President and Directors, for their able management of the affairs of the Association, and to the Chairman for his conduct in the chair this day."
Upon the motion of the Chairman (Sir Julian Goldsmid, Bart., M.P.) a vote of thanks was also given to the Agents and Engineers on the Continent, and the staff in England.
ALBERT F. JACKSON, Secretary.
By order of the Board.
30, Clement's Lane, Lombard Street,
London, E.C., May 27, 1879.

GASHOLDER FOR SALE.

THE Sleaford Gas Company, Limited, have for disposal a GASHOLDER, 32 ft. in diameter by 14 ft. deep, with Counterbalance Weights and Chains, Stone Columns, 5-in. Inlet and Outlet Pipes, Syphons, and Slide-Valves, all complete, the whole in splendid condition and at present in use. To be moved to make room for extensions.
Can be seen, and full particulars obtained, on application to the undersigned.
By order,
HARRY WIMHURST, Manager.
Gas-Works, Sleaford, May 7, 1879.

GAS PLANT FOR SALE.

A 10-in. Vertical Pipe Condenser, having 20 Pipes, each 19 ft. high, on Cast-Iron Base Box.
A Scrubber, 16 ft. high 5½ ft. diameter, fitted with thin boards, Self-Acting Liquor Distributor, 10-in. inlet and outlet pipes.
Two Single-Flue Cornish Boilers (new in 1870), each 9½ ft. long, 3 ft. 9 in. diameter; Fire Tube of Low Moor Iron, complete with all Fittings.
All in good working order; removed to make room for larger plant.
For further particulars apply to THOS. TREWHITT, Gas-Works, WEST HARTLEPOOL.
May 8, 1879.

THE Directors of the Newmarket Gas- light Company invite TENDERS for the AMMONIACAL LIQUOR produced at their Works for One year ending June 30, 1880.
Tenders to be sent on or before Monday, June 2, 1879, to the undersigned, from whom any further particulars may be obtained.
THOMAS WILKINSON, Manager.

GUILDFORD GASLIGHT AND COKE COMPANY.

THE Directors of this Company are prepared to receive TENDERS for the TAR and LIQUOR produced at their Works for the year commencing July 1, 1879.
Tenders, properly endorsed, to be sent, on or before Wednesday, June 10, 1879, to Mr. LONGWORTH, Gas Offices, GUILDFORD, from whom any further required information may be obtained.

THE Directors of the Newmarket Gas- light Company are prepared to receive TENDERS for the Supply of 2000 Tons of Best GAS COAL, to be delivered as required during the next Twelve months ending May 31, 1880.
Tenders, stating price per ton, delivered free at the Great Eastern Railway Station, Newmarket, to be sent on or before Monday, June 2, 1879, to the undersigned, from whom any further information may be obtained.
THOMAS WILKINSON, Manager.

BOROUGH OF BIRMINGHAM.

THE Gas Committee of the Town Council invite TENDERS for the Purchase of the surplus TAR to be produced and manufactured at their works at Adderley Street and Windsor Street, Birmingham, and at West Bromwich, for a period of One year, from July 1, 1879.
Tenders may be made for the supply from one or more of the works.
Further information and forms of tender may be obtained on application to me,
EDWIN SMITH, Secretary.
Offices of the Department, Old Square, Birmingham.

THE Sunbury-on-Thames Gas Company have FOR SALE the following PLANT in good condition, thrown out to give place to larger:—
Two Purifiers, 6 ft. by 3 ft. by 3 ft. 6 in. deep.
Two do., 5 ft. by 3 ft. by 3 ft. deep.
6-in. Connections, with two Lifting Screws and Travellers complete.
Six 6-in. Cathels's Patent Four-way Valves.
Station-Meter to pass 1500 ft. per hour, 4-in. Connections.
4-in. Governor.
5-in. Pipe Condenser.
Six 6-in. Donkin's Valves.
For further particulars apply to Mr. JOHN SMITH, Manager, Gas-Works, Sunbury-on-Thames, MIDDLESEX.

TO COAL PROPRIETORS.

THE Directors of the Cheltenham Gas- light and Coke Company invite TENDERS for the Supply of the best quality of COAL for Making Gas, for One or Two years, from the 1st of July next.
Quantities, particulars, and conditions of Contract may be had on application.
Sealed tenders, addressed to the Engineer, must be forwarded on or before the 18th prox.
The Directors do not bind themselves to accept the lowest or any tender.
R. O. PATERSON, Engineer.
Gas-Works, Cheltenham, May 23, 1879.

TO MANUFACTURING CHEMISTS.

THE Directors of the Hebden Bridge Gas Company are open to receive TENDERS for the TAR and AMMONIACAL LIQUOR manufactured at their Works for One, Two, or Three years, commencing from June 1, 1879.
Particulars and forms of tender can be obtained from the Manager, Gas-Works.
Tenders to be sent in not later than the 6th of June, addressed to the Chairman, Gas-Works, Hebden Bridge, and endorsed "Tender for Gas Tar, &c."
By order,
THOMAS HORSFALL, Secretary.

THE Hampton Court Gas Company have FOR SALE, One 40 ft. by 16 ft. GASHOLDER, with six Cast Columns and Wrought Girders. To be Sold for £25, as the position is wanted.
Also the following PLANT, the whole of which is in excellent condition, having been removed for larger:—
One 8-horse Power Vertical Engine.
One 4-horse do. do.
One 15,000 feet Beale's Exhauster.
Two Beale's Slide-Valves for do.
Four Donkin's Valves.
Two Washers, with 8-in. Connections.
For further information, apply to Mr. E. PRICE, Engineer and Manager, Gas-Works, HAMPTON WICK.

LONGFORD GAS COMPANY, LIMITED, IRELAND.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of 400 Tons of Best GAS COAL, to be delivered free into railway waggons at North Wall, Dublin. 200 tons to be delivered immediately, and the remaining 200 tons by the middle of September.
Sealed tenders, marked "Tender for Coal," will be received up to the 6th of June.
Tenders to be accompanied with analysis.
WILLIAM REDDIE, Secretary.
Gas-Works, Longford, May 21, 1879.

THE Directors of the Stretford Gas Com- pany invite TENDERS for the Supply and Erection of a Set of four Purifiers, 20 ft. square, with Centre-Valve and Connections complete.
Drawings and specifications may be seen on and after Wednesday, the 28th inst., at the Company's Office, Stretford.
Sealed tenders, addressed to the Chairman of the Company, to be forwarded not later than June 16, 1879.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
BENJAMIN HAYNES, Secretary.
Gas-Works, Stretford, near Manchester,
May 23, 1879.

TO COAL OWNERS.

THE Gas Committee of the Leeds Corpo- ration solicit TENDERS for the Supply of CANNEL and Best GAS COALS (Screened or Nuts) for Twelve months ending June 30, 1880. Each intending contractor to send at once sample of every description of Coal intended to be offered for the purpose of being tested. If sent by cart, to Gas-Works, New Wortley, and if by truck, to Gas-Works siding, Geldard Junction, Leeds.
Forms of tender may be obtained on application to the Engineer, Gas-Works, Meadow Lane, or the Secretary, Gas Offices, Boar Lane.
Endorsed tenders to be addressed "Chairman, Gas Offices, Boar Lane," not later than Tuesday, the 17th of June next.

PADIHAM AND HAPTON LOCAL BOARD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE above-named Local Board are pre- pared to receive TENDERS for the Supply of GAS COALS for Two years, commencing on the 1st day of July next, to be delivered free at the Padiham Railway Station as may be required. Estimated quantity about 4000 Tons.
Information may be obtained on application to Mr. J. R. Smith, Gas Manager, Padiham.
Sealed tenders, endorsed "Tender for Gas Coals," stating the colliery from whence the coal is proposed to be supplied, to be sent to me, the undersigned, on or before the 31st of May.
The Board do not bind themselves to accept the lowest or any tender.
By order,
ROBERT DUCKWORTH, Clerk to the Board.
Padiham, May 16, 1879.

TO TAR DISTILLERS, MANUFACTURING CHEMISTS, AND OTHERS.

THE Directors of the Drighlington and Gildersome Gaslight Company are prepared to receive TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR produced at their Works, New Lane Bottom, Drighlington, for a term of One, Two, or Three years (as may be agreed upon), commencing the 1st day of July next. Quantity of Coals carbonized about 3000 tons per annum.
Further information may be obtained on application to the undersigned, to whom sealed tenders, endorsed "Tender for Tar or Liquor," must be sent on or before Saturday, the 14th day of June.
The Directors do not bind themselves to accept the highest or any tender.
WM. STANSFIELD, Secretary and Manager.
Drighlington, near Leeds, May 20, 1879.

THE Middleton and Tonge Improvement Commissioners are prepared to receive TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR, together or separate, made at their Gas-Works, Tonge, Middleton, during the ensuing Twelve months ending on June 30, 1880.

Sealed tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Office of the Clerk on or before Monday, June 2, 1879, endorsed "Tender for Tar" or "Ammoniacal Liquor."

The Commissioners do not bind themselves to accept the highest or any tender.

FREDERICK ENTWISTLE,
Clerk to the Commissioners.

Commissioners Rooms, Tonge, Middleton,
May 22, 1879.

THE Directors of the Slough Gas and Coke Company are prepared to receive TENDERS for the construction of a GASHOLDER-TANK and a Telescopic GASHOLDER, 50 ft. diameter by 28 ft. deep. Also a RETORT-HOUSE and COAL STORES.

Drawings, specifications, and conditions of contract may be seen at the Office of the Company, 1, Chandos Street, Slough, Bucks, between the hours of Ten and Four.

Tenders to be delivered at my Office on or before Monday, the 2nd day of June next, addressed to the Chairman, and endorsed respectively, "Tender for Tank," "Tender for Gasholder," "Tender for Retort-House," and "Tender for Roofs."

The Directors do not bind themselves to accept the lowest or any tender.

ARTHUR THOMAS, Secretary.

1, Chandos Street, Slough, May 17, 1879.

BRISTOL UNITED GASLIGHT COMPANY.

TENDER FOR COALS.

THE Directors of the Bristol United Gaslight Company invite TENDERS for the Supply of about 100,000 Tons of GAS COALS, during the Twelve months between the 1st of July, 1879, and the 1st of July, 1880, for use at their Works, situated respectively at Avon Street, St. Philip's, Canons Marsh, and Stapleton Road, Bristol.

Parties desiring to tender for these Coals can obtain specifications and full particulars as to delivery, &c., on application to the Secretary of the Company.

Sealed tenders to be addressed to the Chairman of Directors, Bristol United Gaslight Company, Canons Marsh, Bristol, marked "Tenders for Gas Coal," and delivered not later than Tuesday, the 3rd of June next.

HENRY H. TOWNSEND, Secretary.

Gaslight Offices, Bristol, May 9, 1879.

TO COAL MERCHANTS, SHIPOWNERS, AND OTHERS.

THE Directors of the Torquay Gas Company are prepared to receive TENDERS for the Supply, at the rate of about 600 tons per month, of about 6000 tons (or such other quantity as may be agreed on) of approved GAS COALS.

Tenders to state the price of the Coals, and the freight to Dartmouth, separately and together; and also for delivery into the Company's Works, adjoining the Great Western Railway, free of all charges.

Payment, by cash for freight, on delivery, and by three months bill for the Coals.

Further particulars to be obtained from Mr. Greenfield, the Manager of the Company, Hollacombe, Paignton; and tenders to be sent to the undersigned on or before the 7th day of June next.

By order,
JOHN KITSON, Secretary.

Torquay, May 23, 1879.

TENDERS FOR GAS COAL.

THE Directors of the Commercial Gas Company, London, are prepared to receive TENDERS for the Supply of about 86,000 Tons of Best GAS COALS, to be delivered in the Regent's Canal Basin, for the Stepney Works, and alongside the works at Wapping, in the Thames, and at Poplar, on the Bow Creek.

The quantity to be spread over the year ending June 30, 1880, and be distributed between the works in the following proportions:—

Stepney	21,000 Tons.
Wapping . . .	34,000 ,,
Poplar	31,000 ,,

A copy of the specification with particulars of deliveries, terms of contract, and mode of payments, may be had on application.

Tenders, sealed and endorsed "Tender for Gas Coal," to be forwarded not later than the 12th of June next.

The Directors do not bind themselves to accept the lowest or any tender.

By order of the Board,
E. J. SOUTHWELL, Secretary.

Gas-Works, Ben Jonson Road, Stepney,
May 23, 1879.

ALLIANCE AND DUBLIN CONSUMERS GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for a Supply of the Best Screened Newcastle GAS COAL, in such quantities as may be required during twelve months, from Oct. 1, 1879, the probable amount required being about 90,000 tons. Parties tendering can do so for the whole quantity, or for quantities from 10,000 tons upwards. The Coal must be fresh, of the best quality, properly cleaned, free from dust, stones, pyrites, and all other impurities. The tenders must state and name the locality of the pit, and the particular seam from which the Coal offered is to be supplied. The Contractors will be bound to supply the Coal strictly in accordance with an analysis which must accompany each tender.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, stating price, f.o.b. Tyne Dock, also delivered at the Company's Works, Dublin, must be lodged in my Office on or before the 3rd prox., endorsed "Tender for Coal."

By order,
W. F. CORTON, Secretary and Manager.

Gas Office, 114, Grafton Street, Dublin,
May 21, 1879.

BOROUGH OF BIRKENHEAD.

THE Corporation of Birkenhead invite TENDERS for the Supply of Best Screened GAS COAL and CANNEL at the rate of 14,000 Tons of Coal and 10,000 Tons of Cannel per annum, for One, Two, or Three years from the 30th of June next, to be delivered at their Gas-Works, Thomas Street, Birkenhead, in weekly quantities to be agreed upon. Also TENDERS for the Supply of STEAM COAL delivered at their Water-Works, Spring Hill, Ball's Road, and Flaybrick Hill, Upton Road, in quantities as may be ordered by their Engineer, during One, Two, or Three years from the 30th of June next.

Tenders specifying the description of Coal or Cannel, and endorsed "Tender for Coal, &c.," addressed to the Chairman of the Gas and Water Committee, 50, Hamilton Square, Birkenhead, to be sent in not later than Friday, the 13th of June next.

The Coal or Cannel will require to be carted from the railway to the respective works, and weighed over the Corporation's weighing machines at the rate of 20 cwt. to the ton.

The Corporation do not bind themselves to accept the lowest or any tender, and they are to be at liberty to accept any less quantity at the rate quoted.

By order,
AMBROSE WALN, Town Clerk.

Municipal Offices, Birkenhead, May 17, 1879.

THE Directors of the Aylesbury Gaslight and Coke Company are prepared to receive TENDERS for the Supply of about 2000 Tons of Best GAS COAL, to be delivered as required during the next Twelve months ending June 30, 1880.

Tenders to be sent in not later than June 3, 1879, and addressed to the Chairman of the Gas Company, endorsed "Tender for Coal."

Any further information may be obtained from the undersigned,

GEORGE LANE, Manager.

BOROUGH OF BURNLEY.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Corporation of Burnley are prepared to receive TENDERS for a Supply of Good GAS COAL, screened or unscreened, for a period of One, Two, or more years, from the 1st of July next, to be delivered into waggons at their Wharf on the Leeds and Liverpool Canal.

The quantity required will be 15,000 tons for the first year, and the Contractor must agree to supply any additional quantity required at the contract price.

Persons tendering must state the name of the mine, and guarantee the particular seam from which the Coal is to be supplied, as free as possible from sulphur, bats, bind, dirt, refuse, &c.

Further particulars may be obtained on application to Mr. S. P. Leather, Gas-Works Manager and Engineer.

Sealed tenders, endorsed "Tender for Coal," stating the price per ton, screened and unscreened, must be sent to the Chairman of the Gas Committee, 1, York Street, Burnley, not later than the 28th of May inst.

By order,
A. B. CREEKE, Town Clerk.

Corporation Offices, Burnley, May 9, 1879.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of this Company are prepared to receive TENDERS for Screened COALS, NUTS, and CANNEL, to be delivered, carriage free, on to their Sidings in Coldham's Lane, in the following monthly quantities, viz.:—

	Coals.	Nuts.	Cannel.
July, 1879 . .	600 . .	300 . .	50 Tons.
Aug., ,, . .	600 . .	300 . .	50 ,,
Sept., ,, . .	600 . .	300 . .	100 ,,
Oct., ,, . .	900 . .	400 . .	100 ,,
Nov., ,, . .	1000 . .	500 . .	150 ,,
Dec., ,, . .	1000 . .	500 . .	150 ,,
Jan., 1880 . .	900 . .	400 . .	100 ,,
Feb., ,, . .	600 . .	300 . .	100 ,,
Mar., ,, . .	600 . .	300 . .	100 ,,
April, ,, . .	600 . .	300 . .	100 ,,
	7400	3600	1000

They are to be the best of their kind, and free as possible from sulphur, bats, or bind, and be weighed, 20 cwt. to the ton; but the Directors will not accept tenders for less than 4000 tons.

Payment will be made monthly, but the Directors do not bind themselves to accept the lowest or any tender, until after a fair trial of the Coals.

Sealed tenders, to be addressed to the Chairman, to be delivered not later than Wednesday, June 4, 1879.

JAMES WEEKS, Manager.

Gas Office, May 22, 1879.

COMMERCIAL GAS COMPANY.

TO TAR CONTRACTORS.

THE Directors of the Commercial Gas Company are prepared to received TENDERS for the Surplus TAR produced at their several Works for the Twelvemonth ending June 30, 1880.

The quantities are estimated to be as under, but the same cannot be guaranteed, and may be more or less:—

At the Stepney Works, in the Regent's Canal, 860,000 gallons.

At the Wapping Works, in the Thames, 320,000 gallons.

At the Poplar Works, in Bow Creek (free waterway), 450,000 gallons.

The tenders may be for the whole or for one or more Works separately.

The Contractors must give security to remove the Tar as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the contract.

The form of agreement, to be signed, can be seen at the Company's Offices.

Tenders, sealed and endorsed "Tender for Tar," to be delivered not later than the 12th of June next.

The Directors do not bind themselves to accept the highest or any tender.

By order of the Board,
E. J. SOUTHWELL, Secretary.

Gas-Works, Ben Jonson Road, Stepney, E.
May 23, 1879.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT GAS-BURNERS

FOR

STREET LIGHTING, &c.

Speaking of these burners, erected on the Thames Embankment by Westminster Bridge, the *Daily News* says:

". . . . A blaze of light is thrown out, which, in point of efficiency and brilliancy, far surpasses the large gas-lamps lately erected in Waterloo Place, *while even the electric lights are quite thrown into the shade.*"

SOLE MANUFACTURERS:

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MANUFACTURED SOLELY BY

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These Exhausters have but one solid slide, which ensures less wear and tear, and less friction, and thus fewer repairs are necessary. They are made with two outside bearings and all latest improvements.

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VALVES FOR GAS, WATER,
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THE FIRST VOLUME

OF

KING'S TREATISE

On the Science and Practice of the Manufacture and Distribution of

COAL GAS.

Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E., and W. T. FEWTRELL, F.C.S.

Orders received by

WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.

BOROUGH OF SOUTHPORT.

THE Gas Committee are prepared to receive TENDERS for the Supply of FIRE-CLAY RETORTS and FIRE-BRICKS required at the Corporation Gas-Works, Crowlands.

Further information may be obtained on application to Mr. John Booth, Gas Manager.

Tenders, properly endorsed, to be sent in to the undersigned not later than the 28th inst.

By order,
KEIGHLEY WALTON, Town Clerk.

Town Hall, Southport, May 17, 1879.

SUNDERLAND GAS WORKS.

SULPHATE OF AMMONIA WORKS.—CONTRACT FOR APPARATUS.

THE Directors of the Sunderland Gas Company are prepared to receive TENDERS for the Construction and Erection of certain Stills, Saturators, Tanks, Evaporators, and other Apparatus required for the Manufacture of Sulphate of Ammonia at the Hendon Station of their Gas-Works, together with certain cast and wrought iron materials connected therewith.

Drawings may be seen, and specifications and forms of tender may be had on application, at the Office of the Company, in Fawcett Street, Sunderland, and at the Office of Messrs. Thomas and Charles Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., on and after Thursday, the 15th day of May inst., and tenders must be delivered at the Office of the Company, at or before Ten o'clock in the forenoon of Tuesday, the 3rd day of June next.

The Company do not bind themselves to accept the lowest or any tender.

By order,
J. H. COX, Secretary.

Sunderland, May 14, 1879.

THE ACCRINGTON GAS AND WATER-WORKS COMPANY.

COAL CONTRACTS.

THE Directors of this Company invite TENDERS for the GAS COAL and CANNEL they may require during One, Two, or Three years from the 1st of July next, to be delivered free in trucks at the Railway Station, Accrington, at the Canal Wharf, Oakenshaw, and, if required, on their Siding, Great Harwood; in such quantities, and at such times, as the Directors or Secretary for the time being may require.

Sealed tenders, endorsed "Tender for Coal," and addressed to the Chairman, General Offices, Gas-Works, Accrington, to be sent in not later than 6 p.m. of Wednesday, the 4th of June.

Printed conditions of tender may be obtained on application to the Secretary of the Company.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
CHARLES HARRISON, Secretary.

May 3, 1879.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

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As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

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BRITISH
ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING OF MEMBERS.

PROGRAMME OF ARRANGEMENTS.

THE

SIXTEENTH ANNUAL GENERAL MEETING

OF THE MEMBERS OF THIS ASSOCIATION WILL BE HELD ON

TUESDAY, WEDNESDAY, THURSDAY, & FRIDAY, June 10, 11, 12, & 13, 1879,

AT THE

INSTITUTION OF THE PHILOSOPHICAL SOCIETY,

NEWCASTLE-ON-TYNE.

WILLIAM J. WARNER, ESQ., C.E., PRESIDENT,
Will occupy the Chair.

ORDER OF PROCEEDINGS.

TUESDAY, JUNE 10, 1879.—Morning Meeting.

The Chair to be taken at Ten o'clock.

Inaugural Address by the President. | Admission of New Members.
Reading of Papers and Communications.

Evening Meeting.

The Chair will be taken at Half-past Seven.

A Lecture will be delivered by G. A. LEBOUR, Esq., F.G.S., Professor of Geology in the University of Durham College of Physical Science, Newcastle-on-Tyne, on "Practical Notes on Coal and Coal Getting."

WEDNESDAY, JUNE 11, 1879.

The Chair to be taken at Ten o'clock.

Reading of Papers and Communications, and the Transaction of other Business.
Election of Officers for the ensuing Year, &c.

At Six p.m. the Members and Friends will dine together at the Assembly Rooms, in Newcastle-on-Tyne.
Tickets for the Dinner, 7s. 6d. each, may be had from the Secretary, if taken on or before the 10th of June. After that date 10s. will be charged.

THURSDAY, JUNE 12, 1879.

The North of England District Association and their friends, being desirous of offering hospitality to the Members of the British Association of Gas Managers, have invited them to an Excursion to Alnwick Castle, one of the seats of the Duke of Northumberland, on whose grounds a Luncheon will be provided, and on

FRIDAY, JUNE 13, 1879,

The Members will be invited by the same body to inspect the Engineering Works of Sir Wm. G. Armstrong & Co., the Swing Bridge, Chemical and other Works on the Tyne, and then proceed to dine at the Aquarium, at Tynemouth.

Detailed particulars of these Excursions will be announced at or before the meeting on the 10th.

LIST OF PAPERS AND COMMUNICATIONS

TO BE SUBMITTED TO THE MEETING.

The Order in which the Papers are to be Read will be determined by the Committee prior to the Meeting, so as to suit the general convenience.

1. "The Automatic Pressure Changer." By WM. COWAN, of Edinburgh.
2. "How can Gas Companies best Promote the Application of Gas for Heating Purposes?" By THOS. TRAVERS, of Cork.
3. "Lighting by Gas and Electricity." By WM. SUGG, of London.
4. "Notes on the Rapid Corrosion of Gasholders in Hot Climates." By L. MONK, of Lanark.
5. "Protective Paints for Gasholders." By J. DOUGLAS, of Portsea.
6. "Gas-Engines." By W. CARR, of Halifax.
7. "Coke, the Best Means of Utilizing It." By C. SELLERS, of York.
8. "Economy in the Construction of Engineering Works." By J. W. SANDEMAN, of Newcastle-on-Tyne.
9. "A New Form of Condenser." By J. DOUGLAS, of Portsea.
10. "A New Form of Condenser." By W. WRIGHT, of Brighton.
11. "The Application of Hydraulic Machinery to Gas-Works." By J. A. G. ROSS, of Newcastle-on-Tyne.
12. "Economy in Raising Steam in Connection with Gas-Works." By F. M. HARRIS, of Falmouth.
13. "The Albo-Carbon Light." By J. DOUGLAS, of Portsea.
14. "The Lamplighter's Tell-Tale and Time-Keeper." By E. PRICE, of Hampton Wick.
15. "The Gas Supply-Pipes Beyond the Consumer's Meter." By N. H. HUMPHRYS, of Westbury.
16. "The Estimation of Ammonia in Gas Liquor." By WM. FOSTER, of London.
17. "Hydraulic *v.* Faced Valves for Purifiers." By JAS. THOMAS, of Bodmin.

May 26, 1879. WILLIAM H. BENNETT, *Secretary.*

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LABOUR-SAVING SCREEN OR SIFTER.

In screening breeze, the coarse material falls on a tray supported by the handles of the Machine, thus making it convenient for picking the clinkers from the same, whilst the fine falls on a shoot behind, which is fixed to the bottom of the sieve B. In screening gravel or other material, the coarse will fall into a barrow direct, and the fine be conveyed by the shoot into a barrow at the other end, or at the bottom.

To practical men the advantages of this Machine will be evident. It secures at once a saving of time, labour, and expense, as by it a much greater quantity of material can be sifted in the same space of time.

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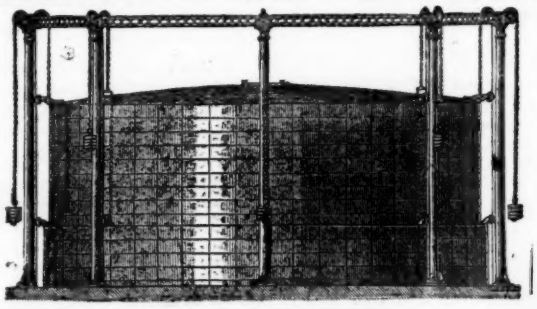

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FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

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This Work contains information with regard to the practice of Parliament during the last fourteen years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings, comprising—Authorized share and loan capital, Rates of dividend, Capitalization of profits, Term for the repayment of loans, Instances in which new shares are to be sold by auction and Exceptions to the Standing Order requiring new shares to be sold by auction, The limitation of back dividends, Illuminating power, Purity, Price, Notice before testing, The conditions under which the public supply of gas is regulated, Alteration of mains, Instances in which maps of mains are required, and All cases in which undertakings have been transferred, since 1845 in gas and 1865 in water, from Companies to Local Authorities.

In the Water Precedents will be found, in addition, The rates for a supply for domestic purposes, and the Rates for other than domestic purposes.

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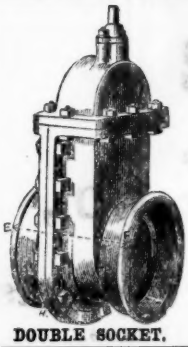
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Proved to 400 feet head of water before leaving the Works
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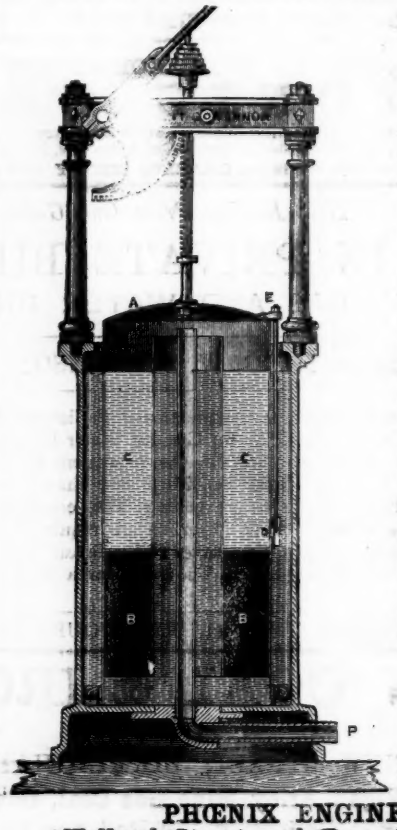

DESCRIPTION OF THE APPARATUS.

The illustration represents a section of the Patent Governor. The lower part of the Bell A is fitted with a loose Float B, and in the upper part of the Bell is a deep annular Water Chamber C, at the bottom of which is an opening D, with a slide outside regulated by a Screw Spindle E, to allow the water to pass in and out of the Chamber C quickly or slowly, according to circumstances, but when once adjusted the slide does **not require altering.** This Self-compensating Chamber gives great steadiness to the up and down movement of the Bell and effectively prevents the "hunting" motion so common with other Governors, thereby ensuring a more perfect action on the throttle-valve of the Engine **than attained by any other.** The sketch shows the clip lever fixed to work on throttle-valve at an angle, and can work in either direction. P is the Gas Inlet-pipe to Governor.

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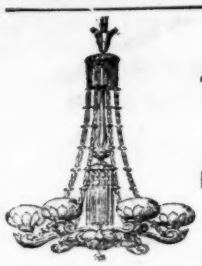

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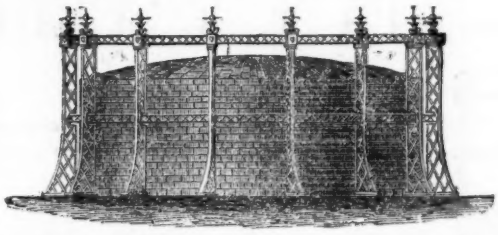

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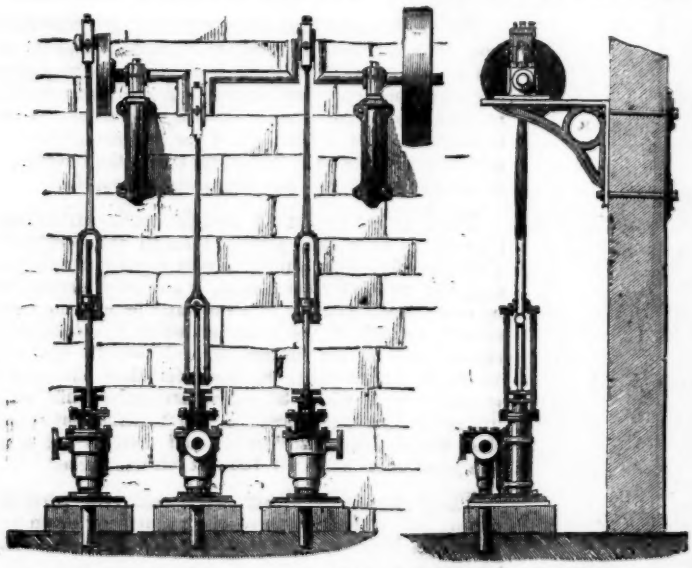

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GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1835.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B., GLASGOW

Prices on application.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

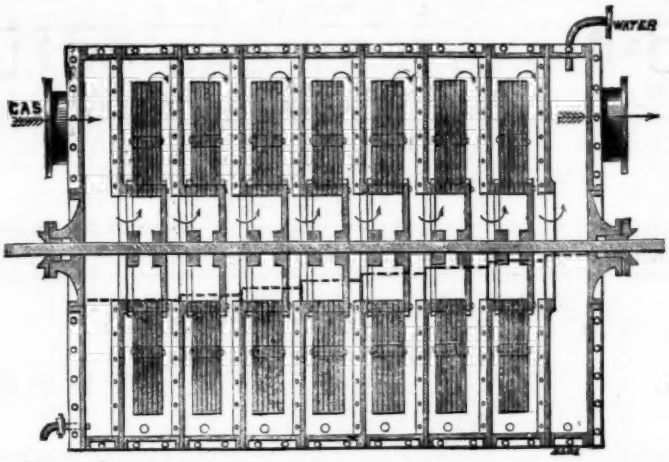
They contain their own engine power, re- quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

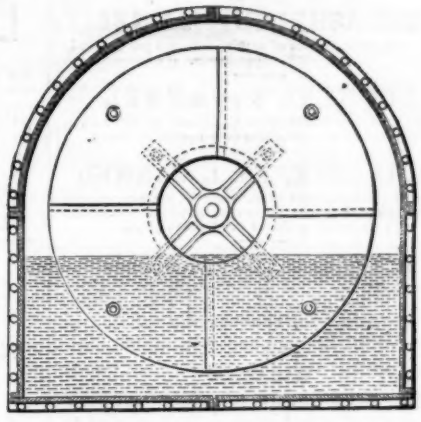
Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

THE

"STANDARD" WASHER & SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]





This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective.

That the distribution of the liquor is made with unerring regularity.

That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather.

That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided.

That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas.

That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

That it is much cheaper than any other Scrubber that will do the same amount of work effectually.

That it is the only Washer suitable for purifying Gas from all its impurities by solution.

That it works with a minimum of pressure.

That it takes out every trace of Ammonia from the Gas in once traversing the machine.

That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

(Copy.) *The Gaslight and Coke Company*
D. HULETT, Esq. *Bromley-by-Bow, May 3, 1877.*

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

(Copy.) *The Leeds Corporation Gas-Works,*
Messrs. KIRKHAM, HULETT, and CHANDLER. *York Street, Leeds, Dec. 6, 1878.*

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber**, so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel.** The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

(Copy.) *The Gaslight and Coke Company.*
Messrs. KIRKHAM, HULETT, and CHANDLER. *York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia**, while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.

I remain, Gentlemen, yours truly, (Signed) JOHN CLARK.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 1	8½	6¾	5	3½	2½	1½	¾	¼	0	0	10 Gallons.	52,000	Nil.	77°	73°	48°	24	23	7½
,, 2	8¾	7	6	4½	3½	2¾	1½	¾	¼	0	10 ,,	57,000	Nil.	73°	66°	32°	21½	20½	4
,, 3	9¼	8	6	3½	3	2¾	1½	¾	¼	0	10 ,,	60,000	Nil.	73°	68°	40°	23½	22	4
,, 4	9¼	7¾	6½	4¼	3½	2½	1¼	¾	¼	0	10 ,,	65,000	Nil.	74°	68°	33°	24	22½	5
,, 5	9¼	7	6	4	3	2½	1¼	1	¼	0	10 ,,	34,000	Nil.	77°	68°	35°	14½	14	5
,, 6	9¼	7¼	6½	4½	3	2¼	1½	1	¼	0	10 ,,	63,000	Nil.	72°	66°	27°	24	22½	4½
,, 7	11	9	7	5½	3½	3	1½	1½	½	0	10 ,,	59,000	Nil.	74°	66°	31°	25	23½	5
,, 8	9½	7½	6	4½	3	2	1	½	¼	0	10 ,,	78,000	Nil.	73°	61°	31°	28	26½	4½
,, 9	11	9	7	5	3½	2½	1½	1	¼	0	10 ,,	82,000	Nil.	74°	67°	33°	27½	25½	5
,, 10	10¾	8½	6¾	5	3½	2½	1½	1	¼	0	10 ,,	66,000	Nil.	76°	64°	28°	28½	27	5
,, 11	12½	10	7¾	5½	4½	3½	1¾	1¼	¼	0	10 ,,	61,000	Nil.	73°	64°	27°	26½	25½	5
,, 12	11	8¾	6¾	—	—	—	1¼	½	¼	0	10 ,,	39,000	Nil.	74°	64°	27°	26½	25½	5
,, 13	13	10¾	8¼	6	4¾	3½	2	1½	½	0	10 ,,	78,000	Nil.	73°	65°	42°	28	26	5

(Signed) JOHN CLARK, Engineer.

WASHER-SCRUBBERS OF THIS PATENT ARE IN COURSE OF CONSTRUCTION FOR BECKTON, BRADFORD, GREENWICH, WOOLWICH, AND SEVERAL OTHER GAS-WORKS.

For further particulars and testimonials, address

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERBURN, FERGUSON AND CO., 21, Lime Street, LONDON, E.C.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67 *candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON. London Agents: SMITH BROS., 38, THROGMORTON ST., E.C.

THE BROUGHTON COAL COMPANY,

COLLIERIES, NEAR WREXHAM,

Are prepared to Supply their excellent GAS COAL on very favourable terms.

This Coal yields more than 10,000 cubic feet per Ton of gas of good quality, *in practical working on the large scale.*

A large purchaser reports the coke to be clear, of a quality rarely equalled in the retort-furnace, and much liked by the stokers.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

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GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

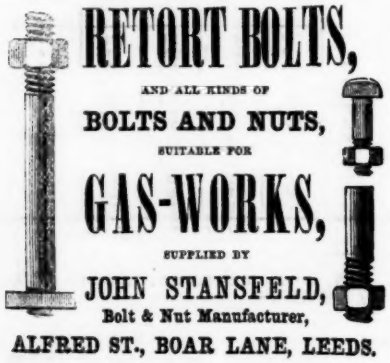
For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

M. BREMOND'S NAPHTHALINE PROCESS.

A negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

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SUPPLIED BY

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AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

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Analyses and Quotations on application.

LONDONDERRY GAS COALS

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MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

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London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

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GAS AND CONSULTING ENGINEER,

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WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

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J. & J. BRADDOCK,

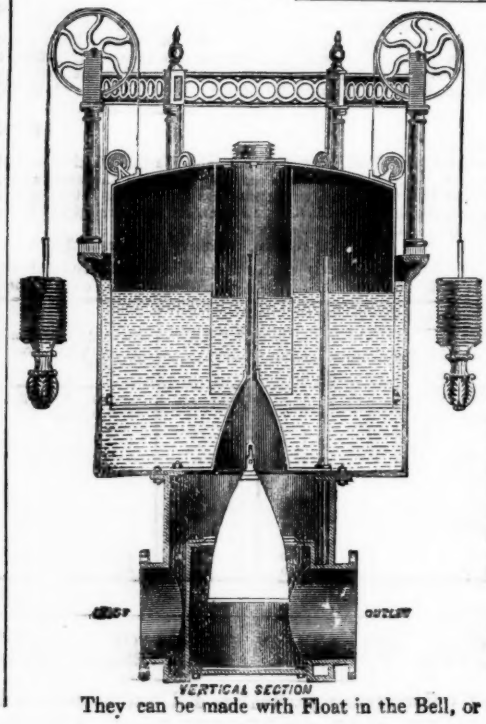
GLOBE METER-WORKS,

OLDHAM,

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—
"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces 12,240 cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

SULPHATE AMMONIA.

R. W. WALLACE & CO.,

60, MARK LANE, LONDON, E.C.,

Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

PARIS EXHIBITION, 1878.

THREE MEDALS
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HONOURABLE MENTION
HAVE BEEN AWARDED TO
JOSEPH CLIFF & SONS
For their Various Exhibits, amongst which is a
SILVER MEDAL
FOR THEIR
PATENT MACHINE-MADE
RETORTS AND FIRE-BRICKS,
Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,
London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"*Warrington Gaslight and Coke Company,*
Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly,
"JAMES PATERSON."

Full particulars will be sent on application to us—address as above.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS.

LONDON, 1851;
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(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

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238, KINGSLAND ROAD, LONDON, N.E.

ALEXANDER WRIGHT & CO.,

MANUFACTURERS OF

"WET" AND "DRY" GAS-METERS,

STATION-METERS, AND GOVERNORS.

METERS, BOXES, REGULATORS, AND ALL REQUISITES FOR PUBLIC LIGHTING.

TESTING APPARATUS for all purposes relating to Gas, &c.

MR. VERNON HARCOURT'S COLOUR TESTS,

Descriptive particulars, per post, 2d.

55, 55a, & 56, MILLBANK STREET, WESTMINSTER, LONDON, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND **GLASGOW.**

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges, Governors, Test Holders, &c., &c.

LONDON OFFICE:

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IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at the Beckton Gas-Works.

DIRECT-ACTING HOISTS

For LIFTING RAILWAY WAGGONS to RETORT-HOUSE STAGEWAY; CAPSTANS for HAULING WAGGONS, &c.,

HYDRAULIC APPARATUS for Lifting and Lowering Purifier-Covers.

Sixteen recently erected at Beckton, applied to Covers 30 feet square.

GAS AND WATER PIPES, ROOFING, BOILERS, &c.

SULPHATE OF AMMONIA APPARATUS,

IN SUCCESSFUL OPERATION AT THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD GAS COMPANY.

For particulars, apply to

JOHN ABBOT & CO., LIMITED,

2, SUFFOLK LANE, CANNON STREET, E.C., or PARK WORKS, GATESHEAD-ON-TYNE.

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